Construction Methods

McGraw-Hill Publishing Company, Inc.

July, 1934

Three Cableways of 1,510 ft. span deliver concrete in 5-yd. buckets for two Montgomery Island locks in Ohio River near Beaver, Pa.

Articles in This Issue on:

LOCKS DAMS ROADS BRIDGES RETAINING WALLS

BUILDING CONSTRUCTION FIELD OFFICE SYSTEM


LOWELL
SAFETY-STEEL
WRENCH
TWO FOOT HANDLE
TESTED
to stand a pull
of
2200 to 2400 lbs.
A NEW HANDLE
FREE FOR A
BROKEN ONE
RETURNED
LOWELL
Bends to warn
you, BUT WILL
NOT BREAK
LOWELL
SAFETY-STEEL
REVERSIBLE RATCHET
WRENCHES
Sizes: Handles—10 in. to 5 ft. in length
Nut Sizes—½ in. to 9⅛ in. in diameter
Continuous Manufacturing for 70 years
Send for Catalog "E"
LOWELL WRENCH CO.
WORCESTER, MASS., U. S. A.
PUMP IT HOME WITH SAFETY WITH A LOWELL SAFETY-STEEL WRENCH

More Explanations of Code Provisions

● Supplementing the eight official "explanations" of code provisions previously reported on this page, the Construction Code Authority has issued twelve more rulings, numbered from 9 to 20, inclusive, abstracted below:

Quotations and Bids

● Explanation 9 defines a "standard product" as one "which can be purchased from a manufacturer or distributor without a special specification." The furnishing of "quotations on standard products" is specifically excluded from the code definition of competitive bidding under Section I (a), Article VII, Chapter I. Under the code it is optional for a contractor to ask for competitive bids or to satisfy his need for prices by utilizing quotations from vendors.

Whether a general contractor is permitted, after he receives a contract, to take revised and additional figures on standard products is explained to be contingent on whether he has received prices by quotation and, if so, whether the terms of the quotations were binding, or whether the vendors were free under their particular codes to requote to the contractor. The fact is pointed out that quotations on standard products are governed by codes of fair competition other than the Construction Code, and this is one reason why the Construction Code does not impose any obligations on members of the construction industry with respect to the handling of quotations.

Architect-Contractor

● Explanation 10 rules that an architect who contracts with an owner to do the work, or takes a job on a cost-plus or time-and-material basis, is governed by the provisions of the General Contractors' Divisional Code (Chapter II).

Rejection of Subcontract Bids

● It is held in Explanation 11 that a general contractor has the right, under Article VII, Section 10, to reject all bids under any subcontract item and to invite new bids after 90 days have elapsed. He may not defeat the purpose of the required 90-day lapse of time before new bids are invited, however, by combining or separating items previously bid upon. Such procedure, Explanation 12 states, does not constitute a substantial change in plans or specifications provided for in Article VII, Section 10.

A general contractor who has rejected all bids on a particular project need not, in calling for new bids, invite all of the subcontractors who had previously bid. He may, at his discretion, invite additional or fewer subcontractor bids, according to Explanation 13.

Construction Methods

McGraw-Hill Publishing Company, Inc.,
330 West 42nd St., New York

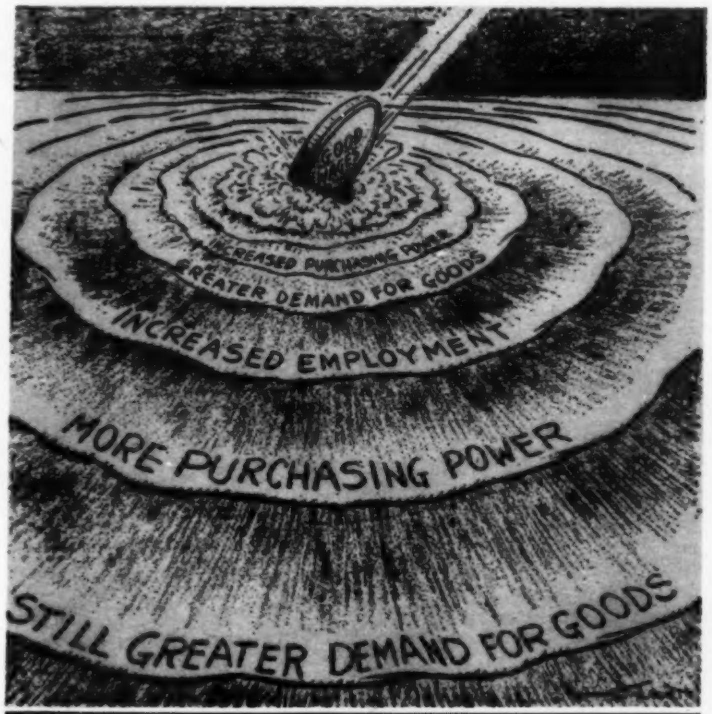
Robert K. Tomlin, Editor

JULY 1934

Willard Chevalier, Vice-President

Editorial Staff: Vincent B. Smith, N. A. Bowers (San Francisco)
Leonard H. Church (Cleveland), Nelle Fitzgerald

The Way It Works



Talburt, in the Washington Daily News

Miscellaneous Rulings

● Explanation 14 rules that an insurance company, making repairs and improvements to its own buildings with crews of 3 to 5 men, including both skilled and unskilled workers, becomes a member of the construction industry and is subject to Code regulations.

An owner, Explanation 15 states, is not liable for a contractor's non-compliance with code provisions.

A contractor, Explanation 16 points out, may not accept or use an unsealed bid.

Approximate Estimates

● Explanation 17 covers an important point that has been worrying many general contractors who are called upon frequently to submit an approximate estimate of the cost of a contemplated construction project, and who solicit the assistance of subcontractors in various lines of work for approximate estimates. The question was asked whether the submission of such approximate estimates constituted competitive bidding under the meaning of the Code. In view of the fact that such estimates are not asked for at a definite, predetermined time, and do not cover a specific program of work definitely to be undertaken, Explanation 17 states that so long as the requests for approximate prices are made under circumstances as outlined, they do not constitute competitive bidding within the meaning of Section 1 (a) of Article VII.

A business man constructing an apartment building under his personal supervision and for himself inquired whether he is bound by the provisions of the Construction Code. Explanation 18 states that the construction work in question comes under the code.

Invitations to Bid

● The Construction Code Authority was furnished with a copy of a postal-card invitation from a general contractor inviting subcontractors to bid on all work within their line on all jobs where the trade reports listed the general contractor's name as figuring the work, and asking the subcontractor, if this arrangement met with his approval, to sign and return the attached card, noting thereon the materials and trade upon which the subcontractor would figure. This cooperation was indicated as enabling the general contractor to file the subcontractor's name on his approved list of subcontractors for work in his line. Explanation 19 refers to the right of the general contractor, as stated in Explanation 6, to send out a general invitation to his list of subcontractors, but rules that a blanket invitation along the lines quoted might constitute the inviting of an unnecessary number of bids and also run afoul of the requirements of Section 5 of Article VII if the technical and financial competency of the proposed bidder had not been demonstrated to the general contractor. Accordingly, a blanket invitation so made is considered to be contrary to the letter and spirit of the Code.

The Construction Code Authority ruled similarly, in Explanation 20, against a blanket invitation as published by a construction news service company which carried a blanket invitation on behalf of certain general contractors to all subcontractors who purchased the service.

Competition Under the Code

● "Competition under the code will be just as keen as it ever was," says a contractor of long and varied experience. No truer summary can be made. Agreement upon a set of rules to raise the standard of sportsmanship does not make the play less intense or the struggle less severe. The code may assure an open field and no favors to all who wish to enter, but it guarantees no one a job or a profit. Rules or no rules, the prize always goes to the winner.

In construction, as in other forms of business, the prizes will continue to go to concerns which possess resources of vitality, enthusiasm and judgment. Their vitality may be found in their personnel and in their financial integrity; their enthusiasm, in the attitude of the men at the top; and their judgment, in their emphasis upon three things: good men, good machines, and *new methods*.

An unvarying rule of their business (be it written or unwritten, recognized or unrecognized) is this: No estimates shall be based solely on the experience of yesteryear. Every piece of new equipment applicable to proposed work must be studied for its possible effect upon costs; every feature of site and of structure must be investigated for economical planning and plant layout. Only by such close study and by a keen awareness of new developments in equipment and materials is the successful bidder able to set a price which assures both a job and a profit.

STRAWS *in the Wind*

MONTH BY MONTH the construction skies are brightening. Daily the trend foreshadows increased and sustained activity. New enterprises, both public and private, are in the making; old obstacles are being cleared away; uncertainty is giving way to confidence. All along the line we discern unmistakable symptoms of real progress.

Newest of these is the Hayden-Cartwright highway legislation. This is important because, first of all, it appropriates $200,000,000 as an emergency grant to the states for this year's road-building. In addition it authorizes a total of $72,000,000 to be spent during the next three years on roads in national forests, parks, Indian reservations and on public lands. A carry-over of about $230,000,000 from last year provides a total of about $502,000,000 as the federal government's direct contribution to road-building.

But this is not all. The act provides also for the reestablishment of the federal aid principle and authorizes the expenditure of $125,000,000 for each of the years 1936 and 1937, provided these sums be matched by the states. This would mean at least another $500,000,000 over those two years.

Then, too, the act strikes a blow at the wholesale and unscrupulous diversion of motor-vehicle taxes by enacting that "it is unfair and unjust to tax motor-vehicle transportation unless the proceeds of such taxation are applied to the construction, improvement or maintenance of highways" and by providing that after June 1935, those states that divert such funds from their proper use shall be substantially penalized in the allotment of federal aid.

All in all then, this act makes possible well over a billion dollars in highway construction during the next three years, assures a continuity of road-building that means much to contractors and others who, doubtful of it, have deferred bringing their plant and equipment up to date, and strikes at the misuse of funds paid by highway users for the construction and upkeep of the roads.

Turning to the general operations of the Public Works Administration, we find a vast volume of work coming through this year. Allotments have been made for both federal and non-federal projects in the amount of $2,179,000,000 of which 62½ per cent is represented by contracts awarded but no more than 15 per cent by expenditures to date. It will be evident that the peak of this construction activity will be reached during the current season.

Another measure that makes for increased construction volume is the National Housing Act. While this does not appropriate public funds for construction purposes, it performs the even more essential function of fostering and stimulating the investment of private funds without which there can be no hope of substantial general recovery. By cutting out some of the evils that have attended the financing of small homes, it aims to encourage home building with private funds and with a greater sense of security than has been possible hitherto. It provides also for mutual insurance of loans for this purpose and for short term loans to finance immediate repair and modernization. It is estimated that a campaign to encourage such work should generate by the fall of 1935 a volume of business amounting to $1,500,000,000.

All these are concrete measures designed to stimulate specific classes of demand. Even more significant for the long term are other items. Financial spokesmen have assured us that amendment of the Securities Act of 1933 would release for investment a large volume of capital that had been frightened off by its provisions. Now the act has been amended. Improvement of the municipal bond market foreshadows more normal conditions in the financing of public works. More general understanding and acceptance of the public works program as a major factor of industrial recovery seems to have stimulated the PWA itself into a burst of unwonted energy, and now it is applying pressure to dilatory projects, rescinding unused allotments and transferring them to projects that are ready for prompt action.

These are but a few of the straws that indicate fairer winds for the construction industry. Current volume is climbing and, even more heartening, public and private trends are in the direction of greater continuity and stability of demand. This is a major requirement for the revival of those basic industries upon which general recovery must depend.

Willard Chevalier

CONSTRUCTION METHODS. July, 1934. Volume 16, Number 7. Published Monthly, price 20c a copy. Subscription rates—United States, Mexico and Central and South American countries, $2.00 a year. Canada, including duty, $2.50 a year. All other countries, $4.00 a year or 16 shillings. Entered as second class matter October, 1926, at Post Office at New York, N. Y., under the act of March 3rd, 1879. Printed in U.S.A. Cable address "McGrawhill, New York." Member of A.B.P. Member of A.B.C.

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

Editorial and Publishing Offices: 330 West 42d St., New York; 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, London, W. C. 2, England. Branch Offices: Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Greenville, S. C. James H. McGraw, Chairman of the Board; Malcolm Muir, President; James H. McGraw, Vice-President and Treasurer; Mason Britton, Vice-President; H. C. Parmelee, Vice-President; Harold W. McGraw, Vice-President; B. R. Putnam, Secretary.


FOR SEWER WORK
• NO OTHER MACHINE WITH THE ADVANTAGES OF THE NORTHWEST PULLSHOVEL •
OVER eleven years ago Northwest pioneered the first successful, full revolving pullshovel, and brought a new ease —a new speed to sewer work. Today the pullshovel has reached the highest point of development in the Northwest.
The double gooseneck feature permits digging to unusual depths. The big dipper with the open throat fills quickly. The heavy duty, slow speed engine "hangs on" in tough digging. The "Feather-Touch" control assures ease and speed of operation. Positive traction on both crawlers at all times makes maneuvering easy.
And last but not least, with the Northwest ease of convertibility you have a machine that can be quickly changed to meet any condition. These are the reasons why Northwest is standard with such contractors as Lock Joint Pipe Company, Mike Pontarelli and many more.
Are you bidding on sewer work?
NORTHWEST ENGINEERING CO.
1728 Steger Bldg., 28 E. Jackson Blvd.
Chicago, Illinois
The world's largest exclusive builders of gasoline, oil and electric powered shovels, cranes, draglines, pullshovels & skimmers
NORTHWEST
SHOVELS • CRANES • DRAGLINES • PULLSHOVELS • SKIMMER SCOOPS

CB·SECTION STEEL BEARING PILES *show* "those from Missouri"

Penetration through 28 to 32 feet of cemented sand and gravel . . . that was the job so successfully accomplished by CB section steel bearing piles in the construction of the bridge over the Black River at Hendrickson, Butler County, MISSOURI. The illustration shows one of eight pile clusters of 10" CB 49# sections partially driven. Note the perfect alignment of the piles and the simplicity of swinging leads and driving rig. 107 CB section piles, totaling 5684 lineal feet, were driven to penetrations ranging from 42′ 6″ to 75′. The CB sections were furnished in 50′, 55′ and 60′ lengths to be cut or spliced in the field as required. Piles were driven to resistances averaging ½" penetration under 100 blows of a 9-B2 McKiernan Terry hammer operating between 120 and 140 blows per minute, thus indicating an average safe carrying capacity of 65 tons per pile. • Carnegie engineers would like to discuss this important subject with you . . . to show you significant facts and figures.

271

BRIDGE OVER BLACK RIVER
at Hendrickson,
Butler County, MISSOURI.
Designed by
MISSOURI State Highway Dept.
General Contractors:
Service Construction Company,
Poplar Bluff, MISSOURI.
Structural Steel Fabricators:
Stupp Bros. Bridge and Iron Co.,
St. Louis, MISSOURI.

CARNEGIE STEEL COMPANY • PITTSBURGH

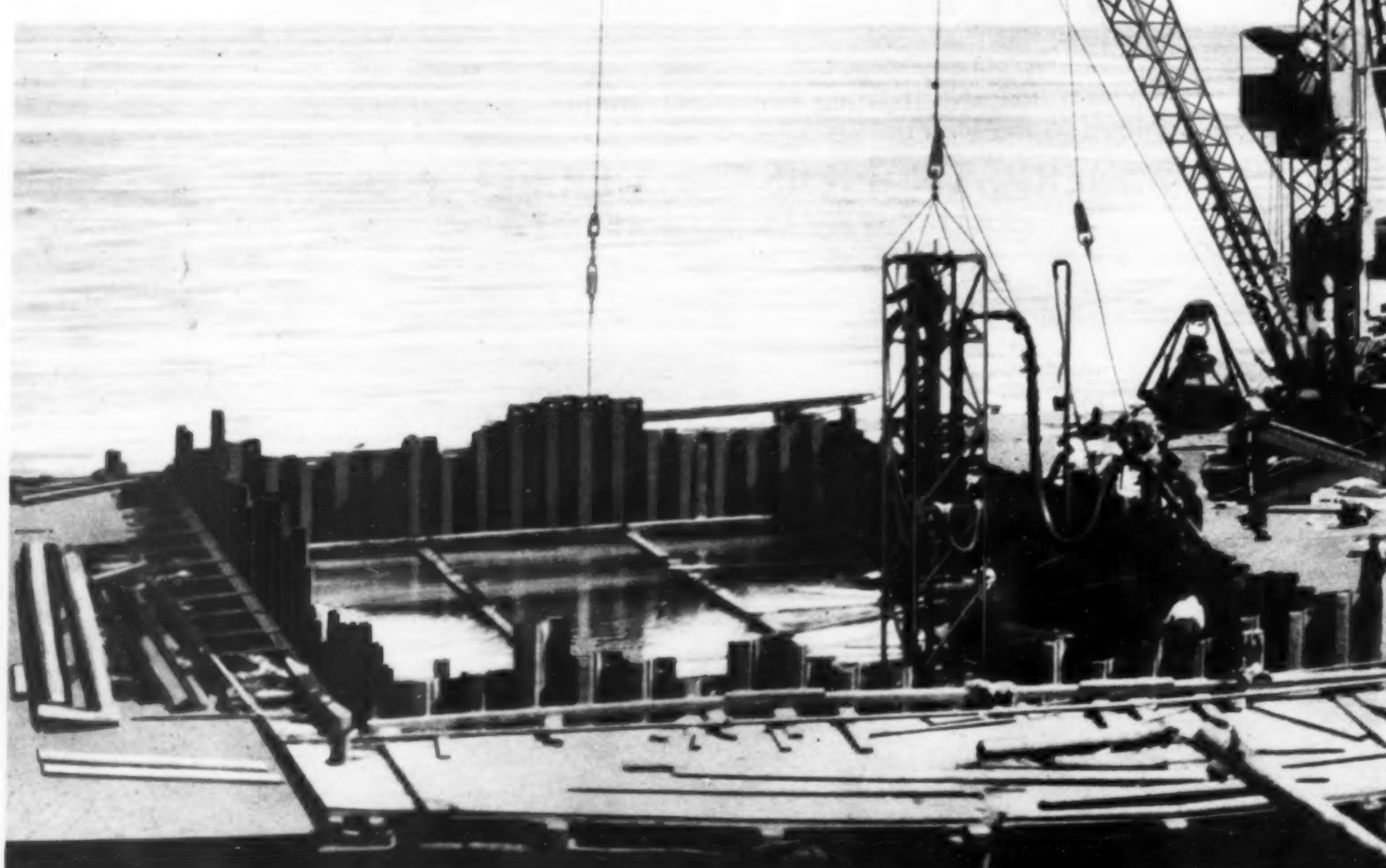
• • • Subsidiary of United States Steel Corporation • • •


WITH ALL ITS
high
QUALITY
"AMERICAN" Hoisting Equipment
is within
TODAY'S PRICE RANGE
At the start we always pay more for the better things of life. Automobiles are a good example. Today general standardization has changed the picture. High quality is available at much lower cost.
"AMERICAN" Hoisting Equipment was "limousine" quality years ago. And it is today. But now the quality that was initiated by outstanding engineering for years past can be obtained at average prices. In due time the new in engineering and in design becomes widely available through the general acceptance of better operating principles. Cost in its turn therefore comes down.
The depression gave us a lot of time to do "home" work. We planned and developed ways and means to short cuts in production and to even better quality. Our established policy based on the best in engineering, design, and construction is still in effect.
However, we do wish to correct price impressions and make the "AMERICAN" Hoisting Equipment low price range as well known as the high quality.
AMERICAN HOIST & DERRICK CO.
SAINT PAUL, MINNESOTA

Cofferdam for Pier 2
San Francisco-Oakland Bridge
built with
BETHLEHEM STEEL SHEET PILING

THE cofferdam for Pier 2 of the San Francisco-Oakland Bridge was 121 ft. long by 51 ft. wide, and 100 ft. deep. The construction of so large a cofferdam involved unusual engineering problems and placed steel sheet piling under severe tests.

The Transbay Construction Company, the contractors, built this cofferdam of Bethlehem Steel Sheet Piling. The piling met every demand and, despite the great lengths involved, was pulled without difficulty.

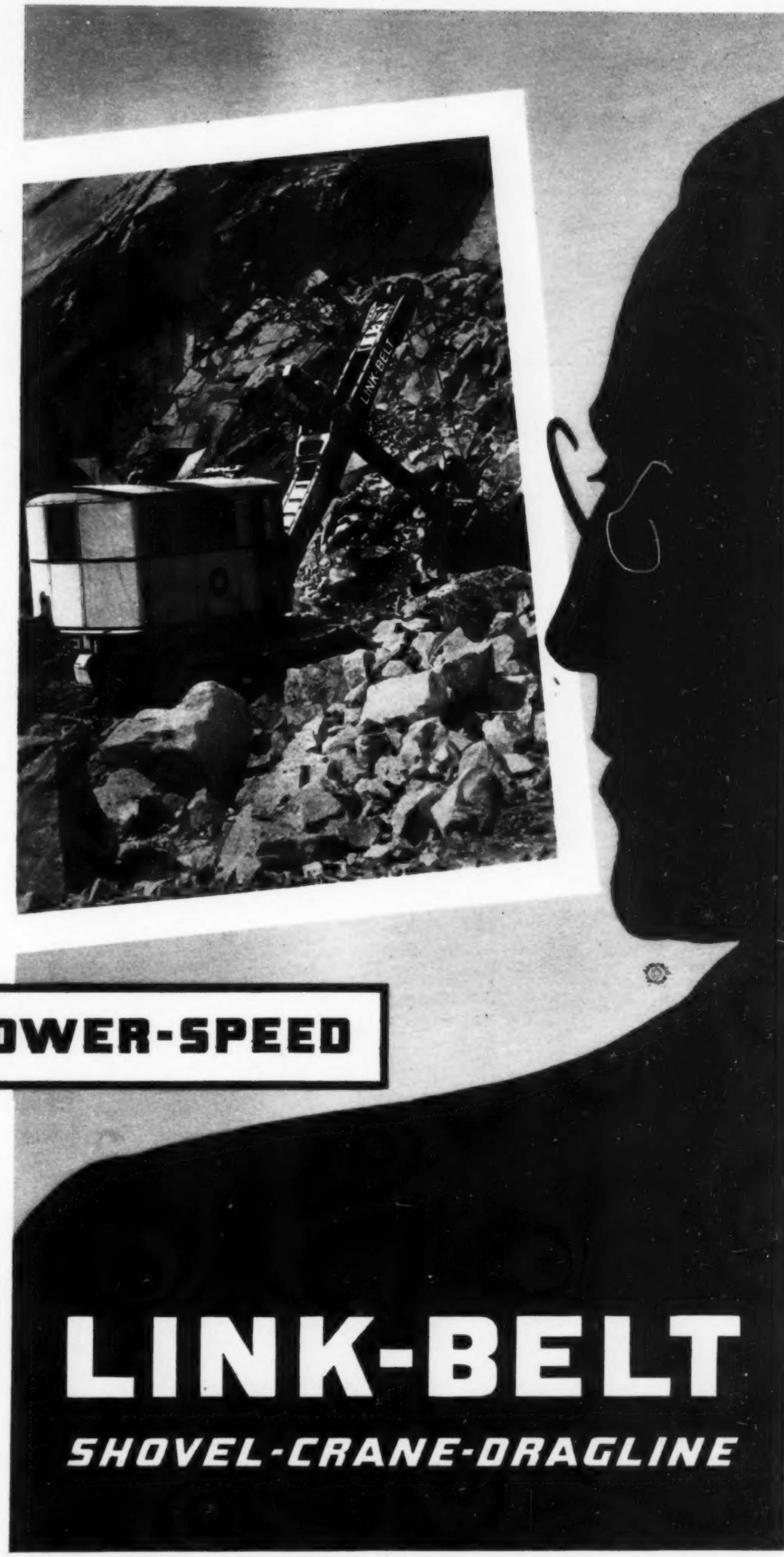


KALMAN STEEL CORPORATION, Subsidiary of Bethlehem Steel Corporation. General Offices: Bethlehem, Pa. District Offices: Albany, Atlanta, Baltimore, Boston, Buffalo, Chicago, Cleveland, Cincinnati, Detroit, Houston, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, St. Paul, Syracuse, Washington. Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Seattle, Portland, Honolulu. Export Distributor: Bethlehem Steel Export Corporation, New York.

Consider

THE WHOLE UNIT

"We ain't hollering about no one gadget or feature." After all, every part that goes into Link-Belt machines must be a champion performer. Link-Belt tolerates nothing but the best throughout the entire structure. When choosing, it's the quality of the entire unit that counts.



STABILITY-POWER-SPEED

From ¾ to 2½ yds. capacity, heavy-duty built. Gas engine, Diesel, or electric motor drive. All models can be shipped loaded on a flat car without dismantling.

LINK-BELT COMPANY, 300 W. PERSHING ROAD, CHICAGO

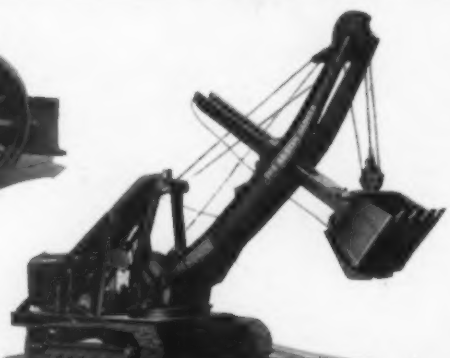
Offices and Distributors in All Principal Cities

See Our Exhibit at A Century of Progress, General Exhibits Building No. 1

5034-A

CONSOLIDATION ANNOUNCED

Roll-A-Plane



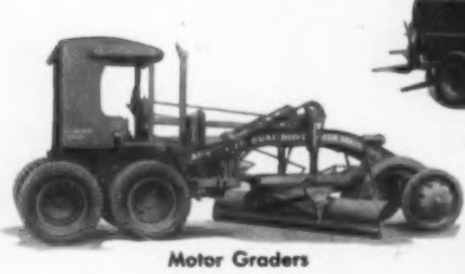
Shovels and Cranes

Wheelers, Scrapers and Plows

Road Graders

Elevating Graders

Bituminous Distributors



Motor Graders

Crawler Wagons

Crushing and Washing Plants

For Better Service, Manufacturing and Distribution, "Austin-Western" Forms One Centralized Organization.

● All members of the road building and contracting industries will observe with interest the formation of the Western-Austin Company. This new, yet familiar, name represents the unification of the Western Wheeled Scraper Company with the Austin Manufacturing Company. Duplications of departments, facilities and sales offices will be reduced.

● The Austin-Western Road Machinery Company has long handled the sales of the products of both companies and continues to do so under the new arrangement. Effective July 1st, the main offices of the Western-Austin Company and The Austin-Western Road Machinery Company will be located at Aurora, Illinois.

● This move, we feel, is not only for the benefit of the companies involved, but of the industries which they serve. The Austin-Western line has been recognized for many years as the most complete in the world. All of the machines have stood for high standards of design, construction and performance. The change announced herewith serves simply to strengthen the manufacturing set-up, simplify distribution and concentrate all service responsibility under one organization.

● Every engineer and contractor should be familiar with the entire Austin-Western line. Write for information on any of the machines pictured here, or the following:

3-WHEELED AND TANDEM ROLLERS

STREET SWEEPERS	GRADING AND ROOTER PLOWS
SNOW PLOWS	WATER SPRINKLERS
BULLDOZERS	TRAILERS
MAINTAINERS	CULVERTS

The Austin-Western Road Machinery Co.

Home Office: Aurora, Ill. Cable Address AWCO, Aurora

Branches in Principal Cities

The Austin-Western ROAD MACHINERY CO.

ROAD ROLLERS, CRUSHING & SCREENING PLANTS, SCARIFIERS, SWEEPERS & SPRINKLERS, ROAD GRADERS, ELEVATING GRADERS. MOTOR GRADERS, PLOWS & SCRAPERS, BITUMINOUS DISTRIBUTORS DRAGS, SHOVELS & CRANES, DUMP WAGONS, SNOW PLOWS.

Free!! ACQUAINT YOURSELF WITH THE LATEST IN SHOVEL AND CRANE DESIGN

The Ohio Power Shovel Company
Lima, Ohio

Gentlemen:

Without obligation please send me copy of Bulletin checked.

Name ______________________

Address ______________________ State ________

Kind of Work ______________________ Position ________

TYPE 302 ☐ ¾ yard capacity.
TYPE 404 ☐ 1 yard capacity.
TYPE 502 ☐ 1¼ yard capacity.
TYPE 601 ☐ 1½ yard capacity.
TYPE 701 ☐ 1¾ yard capacity.

Remarks: ______________________

THESE BULLETINS illustrate and describe LIMA'S complete line of shovels, cranes, draglines and backdiggers, all of which are offered in sizes and types to exactly fit your requirements.

Shovel sizes range from ¾ cubic yard to 1¾ cubic yard capacities, inclusive, and in cranes the capacities range from 12 to 30 tons. All machines can be equipped for gasoline, Diesel or electric power.

Many advanced and exclusive features are incorporated in their design, features which assure faster and more economical operation.

The Coupon above, when filled out and mailed, will bring you a copy of any one or all of these bulletins.

The Ohio Power Shovel Company

DIVISION LIMA LOCOMOTIVE WORKS, INCORPORATED

HOME OFFICE LIMA, OHIO, U.S.A. FACTORY

CHICAGO 1543 Straus Bldg. — NEW YORK 167th Street and Sedgwick Avenue — NEWARK, N. J. 317 Frelinghuysen Avenue — MEMPHIS 77 McCall St. — SEATTLE 2244 First Ave. So — DALLAS 1301 So. Lamar St.

SAN FRANCISCO 26-28 Fremont St. — SPOKANE East 3300 Block Riverside Ave. — LOS ANGELES 4900 Santa Fe Ave. — PORTLAND, ORE. 328 First Ave., S. W. — SALT LAKE CITY 134-140 Pierpont Ave.

SHOVELS
CRANES
DRAGLINES
BACKDIGGERS

LIMA

3-4 YARD
1 YARD
1 1-4 YARD
1 1-2 YARD
1 3-4 YARD
CAPACITIES


"Via Barber-Greene's"

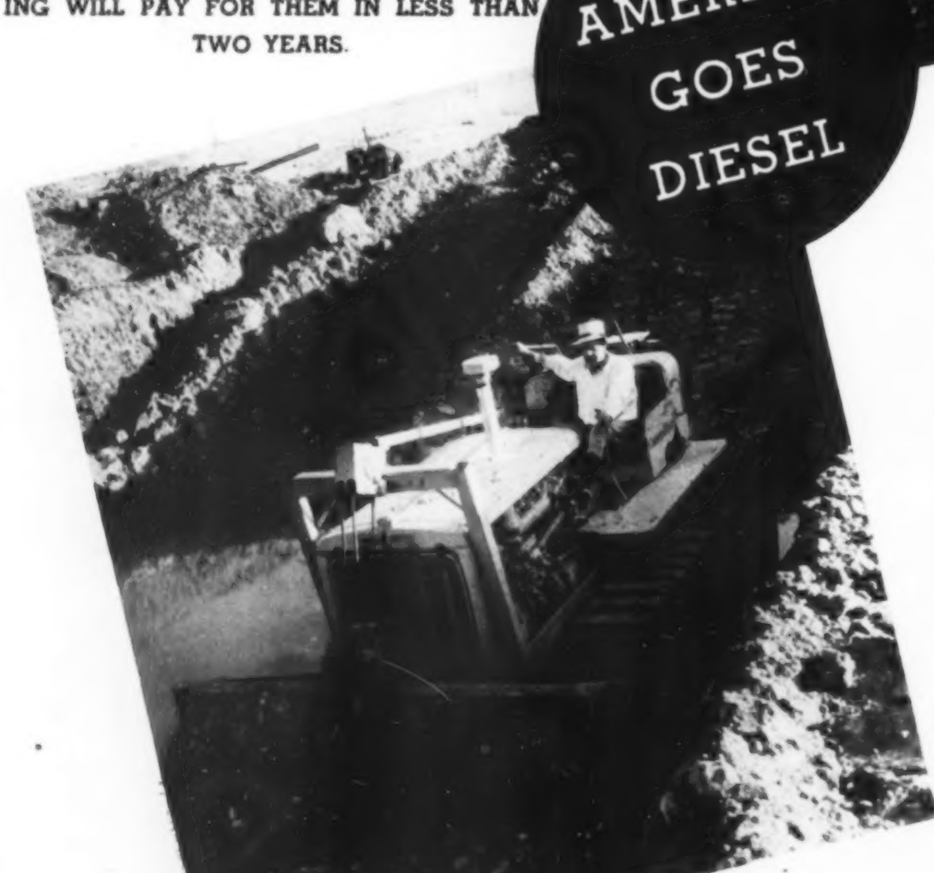
Moving earth to build a race-track near Los Angeles. In two 12-yard trailers, the "Caterpillar" Diesel Seventy-Five moves 119 yards per hour on an 800-foot haul.

"I'm going to 'Caterpillar' Diesels altogether"

• • SAYS C. G. FULLER, CONTRACTOR, OF BARNWELL, SOUTH CAROLINA, WHO ALREADY HAS THREE "CATERPILLAR" DIESELS AND FIGURES THEIR FUEL SAVING WILL PAY FOR THEM IN LESS THAN TWO YEARS.

On a road-building and creek-diversion job near Bloomington, Ill., the "Caterpillar" Diesel Seventy-Five pulls a "Caterpillar" Grader at a fuel cost of $1.96 per 10-hour shift.

AMERICA
GOES
DIESEL



In the foothills of the Sierra Nevadas, in California, this "Caterpillar" Diesel Fifty supplies material to a gold separator.

Every power user is doing a lot of figuring these days. Figuring gasoline costs—figuring the savings from a tractor that burns low-price Diesel fuel, and less of it—figuring the profit that he can earn from investing in "Caterpillar" Diesel power. Many have reached the conclusion that they can't afford not to adopt this modern equipment. Today there are nearly 3000 owners of "Caterpillar" Diesels—tractors and engines. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

SINCLAIR

WINS NAVY OIL CONTRACT 4th TIME!

NAVY DEPARTMENT WILL ALSO USE 1,000,000 GALLONS OF SINCLAIR H-C GASOLINE

The Navy Department has also awarded other huge contracts to Sinclair covering more than a million gallons of gasoline and more than a million dollars worth of fuel oil. Sinclair H-C Gasoline, under the gasoline contracts, will be supplied to Government fire engines, ambulances, fast patrol boats and other emergency equipment.

The U. S. Navy Department has just awarded to Sinclair for the fourth year in succession the annual contract for supplying lubricants to the Navy on the Atlantic seaboard and to other Government Departments in 42 states. Included will be lubricants for battleships, submarines, destroyers, Navy airplanes, motor cars, trucks, tractors, Army tanks, etc. Under this contract Sinclair will supply lubricants for more Government equipment than ever before.

The Navy Department received proposals from various oil companies. Both quality and price were considered in making the formal award which is based on the lowest service cost per gallon, as determined by the Navy Work-Factor Tests.

INDUSTRIAL OILS HEATING OILS GREASES

Dupont Avenue, South, Minneapolis, Minnesota, Tarvia-built in 1921. Thirteen years can make a big difference in shrubs and trees, but it hasn't changed the smooth, easy-riding, skid-safe quality of the Tarvia pavement.

Barrett
Tarvia
GOOD ROADS
AT LOW COST

Tarvia is made by The Barrett Company, America's oldest and most experienced manufacturer of coal-tar road-building materials. It provides a wide choice of suitable low-cost surfaces for new construction or for improving and widening existing roads. With any sort of Tarvia pavement—from improved secondary roads to express highways—repairs and maintenance are low in cost, because they can be made simply and quickly. Ask the Tarvia field man.

THE BARRETT COMPANY New York Chicago Birmingham Philadelphia St. Louis Minneapolis Hartford Detroit Cleveland Boston Buffalo Columbus Milwaukee Providence Syracuse Lebanon Toledo Cincinnati Baltimore Youngstown Bethlehem Rochester Portland, Me. THE BARRETT COMPANY, LTD., Montreal, Toronto, Winnipeg, Vancouver

"After 2000 hours of continuous pumping I have nothing but praise for the Jaeger Pump"

HERE IS THE JOB!

Says
C. A. Fegtly,
Superintendent, Who Used 4 Jaeger Pumps, Day and Night, on Pittsburgh-Des Moines Steel Co. Bridge Job, Pocahontas, Arkansas

"WE have 4 Jaeger Pumps on this job. The pump shown in the pictures has been in operation for about 2,000 hours. This time was continuous except for two periods when the engine was shut down for a few hours to clean carbon. The writer has only praise for this unit."—C. A. FEGTLY, Superintendent, Pittsburgh-Des Moines Steel Company.

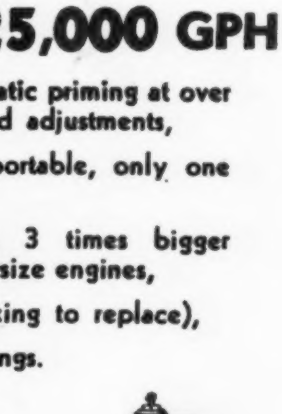
The pumps used on this typical Jaeger job were Model 6P "Sure-Primes," with AGC rating of 90.000 gallons per hour.

2", 3", 4", 6", 8" SIZES, CAPACITIES 10,000 to 125,000 GPH

8", 125,000 GALLON PUMP (AIR CAPACITY OVER 30 CU. FT. PER MIN.)

- 100 per cent automatic priming at over 25 ft. lifts—no hand adjustments,
- Compact, rugged, portable, only one moving part,
- Self-cleaning shell, 3 times bigger water passages, oversize engines,
- Lubri-Seal (no packing to replace),
- Timken or ball bearings.

GET OUR 1934 LOW PRICE on this 2", 10,000 Gal. Pump →



THE JAEGER MACHINE COMPANY
800 Dublin Ave., Columbus, O.
Makers of Mixers, Truck Mixers, Pumps, Placing Equipment, Complete Road Machinery.

Gentlemen: Send Catalog and latest prices on Jaeger "Sure-Prime" Pumps.

Name ....

Address ....

Construction Methods

ROBERT K. TOMLIN, Editor

Established 1919—McGraw-Hill Publishing Company, Inc.

Volume 16—Number 7—New York, July 1934

Local Quarry Furnishes Fill for SAN GABRIEL No. 1 DAM

PREPARATORY to the actual placing of rock in the San Gabriel No. 1 dam, under contract by the Los Angeles County Flood Control District to the West Slope Construction Co., the contractor removed overburden, opened up quarry faces and constructed roadways for delivery of material.

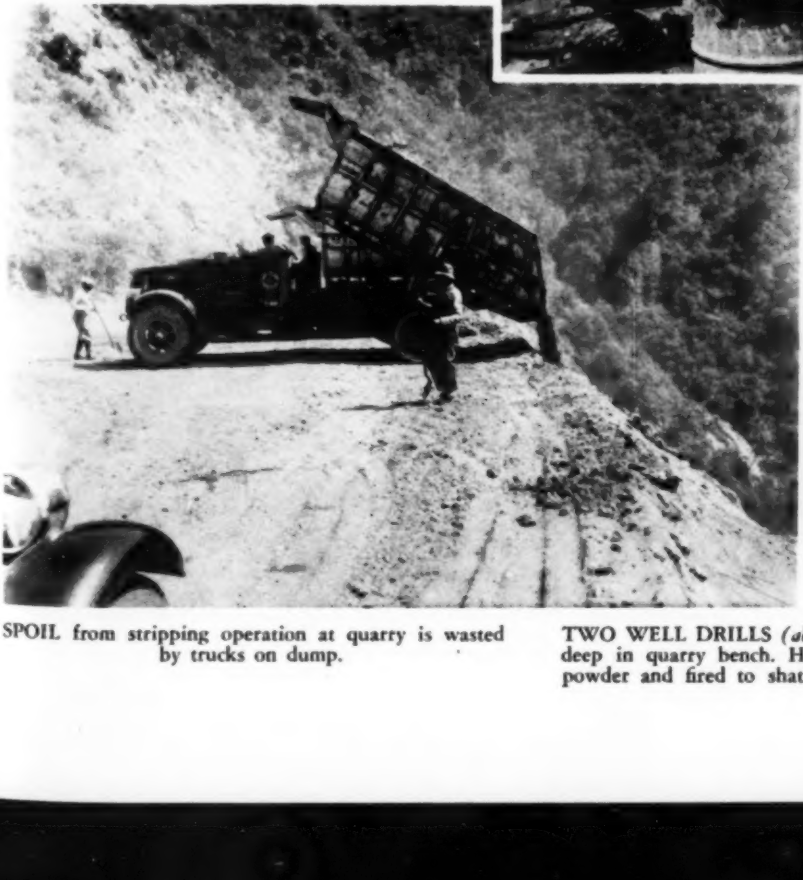
The dam, designed with a base thickness of 1,100 ft., a height of 330 ft., and a crest length of 1,670 ft., is to be a rockfill structure built of material taken from the quarry opened on the east bank of the stream below the site. The average haul from the quarry is about 2,000 ft. Most of this distance is paved with heavy concrete.

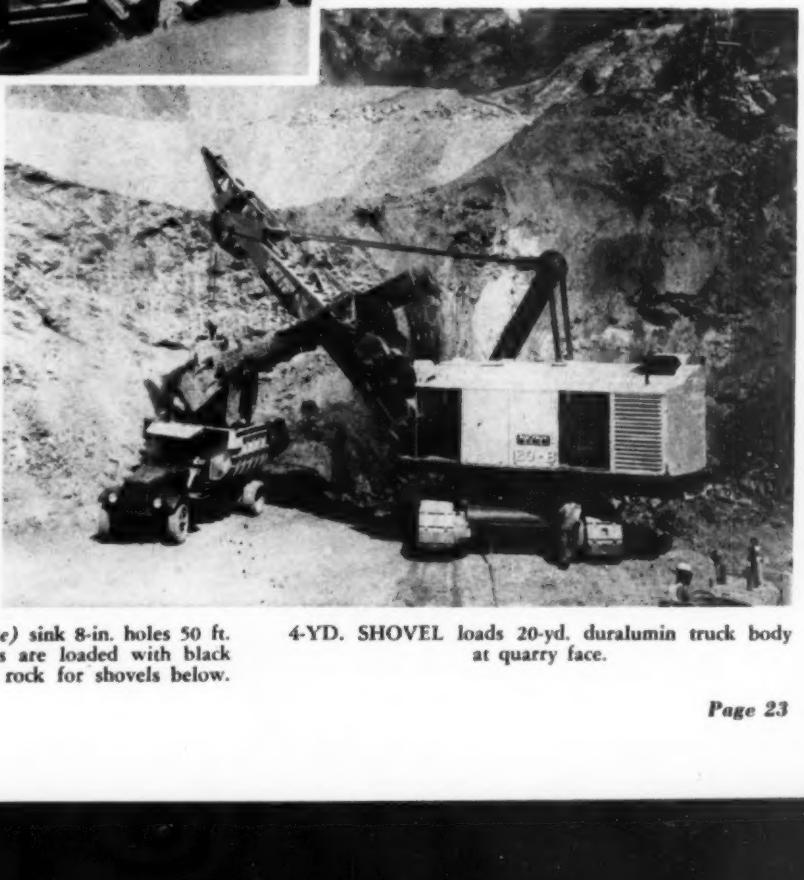
Operation of truck fleets has been well organized for some time, as the same contractor removed material to expose the foundation rock under the dam. On that work a fleet of 40 trucks was employed, including twenty operated by subcontractors.

In the quarry operations during April, the contractor used twenty trucks, ten of which had 20-cu.yd. duralumin rear-dump bodies and the rest, 12-cu.yd. bodies. These trucks were loaded by six Bucyrus-Erie shovels, three 4-yd., two 2-yd., and one $1\frac{1}{4}$-yd.

In actual quarry excavation, the contractor takes out the material in a series of benches, putting down vertical holes near the edge of each bench to shatter the material for convenient removal from the bench below. The holes are put down by Armstrong drills (built by the Bucyrus-Erie Co.) and are shot with black powder.

The West Slope Construction Co. consists of Foley Bros., Inc., of New York and St. Paul; Bates & Rogers Construction Co., of Chicago; L. T. Lawler, of Butte, Mont.; and J. C. Maguire, Los Angeles. E. T. Foley is chairman of the board, W. A. Rogers is president, L. D. Sinclair is secretary, and D. A. Daley is general superintendent on the job.





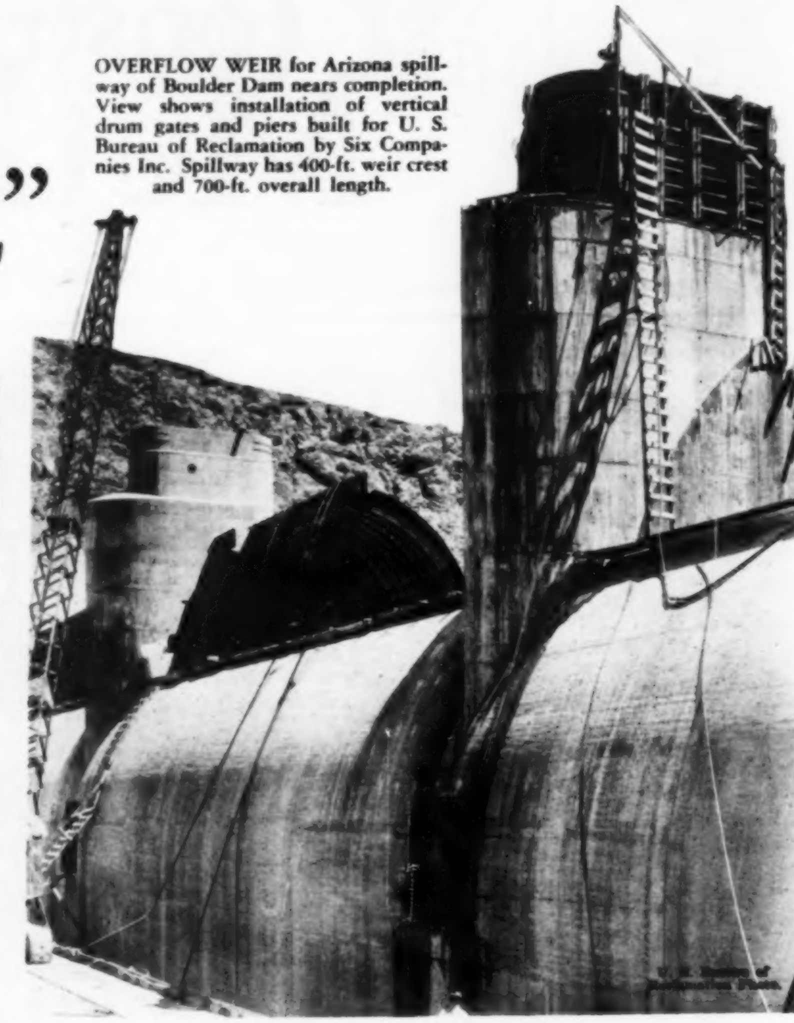
SPOIL from stripping operation at quarry is wasted by trucks on dump.

TWO WELL DRILLS *(above)* sink 8-in. holes 50 ft. deep in quarry bench. Holes are loaded with black powder and fired to shatter rock for shovels below.

4-YD. SHOVEL loads 20-yd. duralumin truck body at quarry face.

This Month's

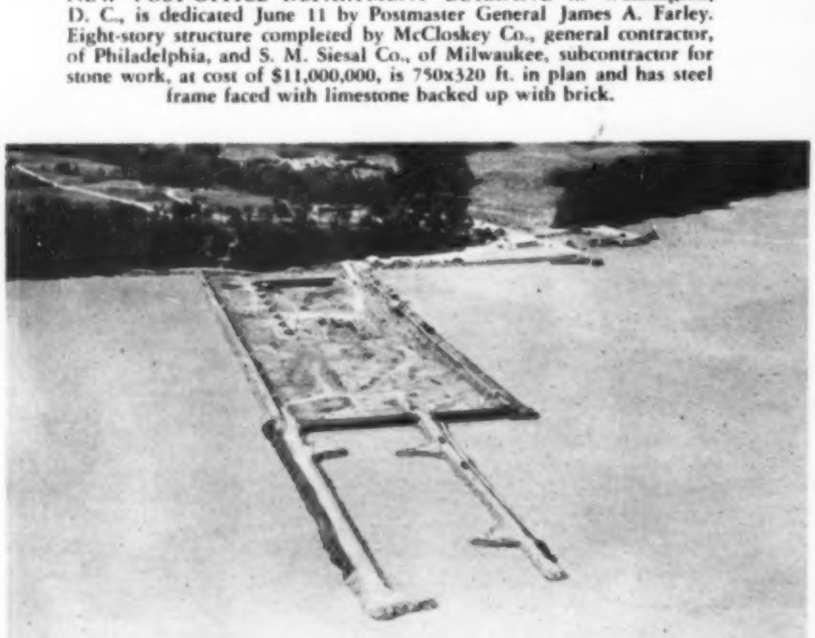
"NEWS REEL"



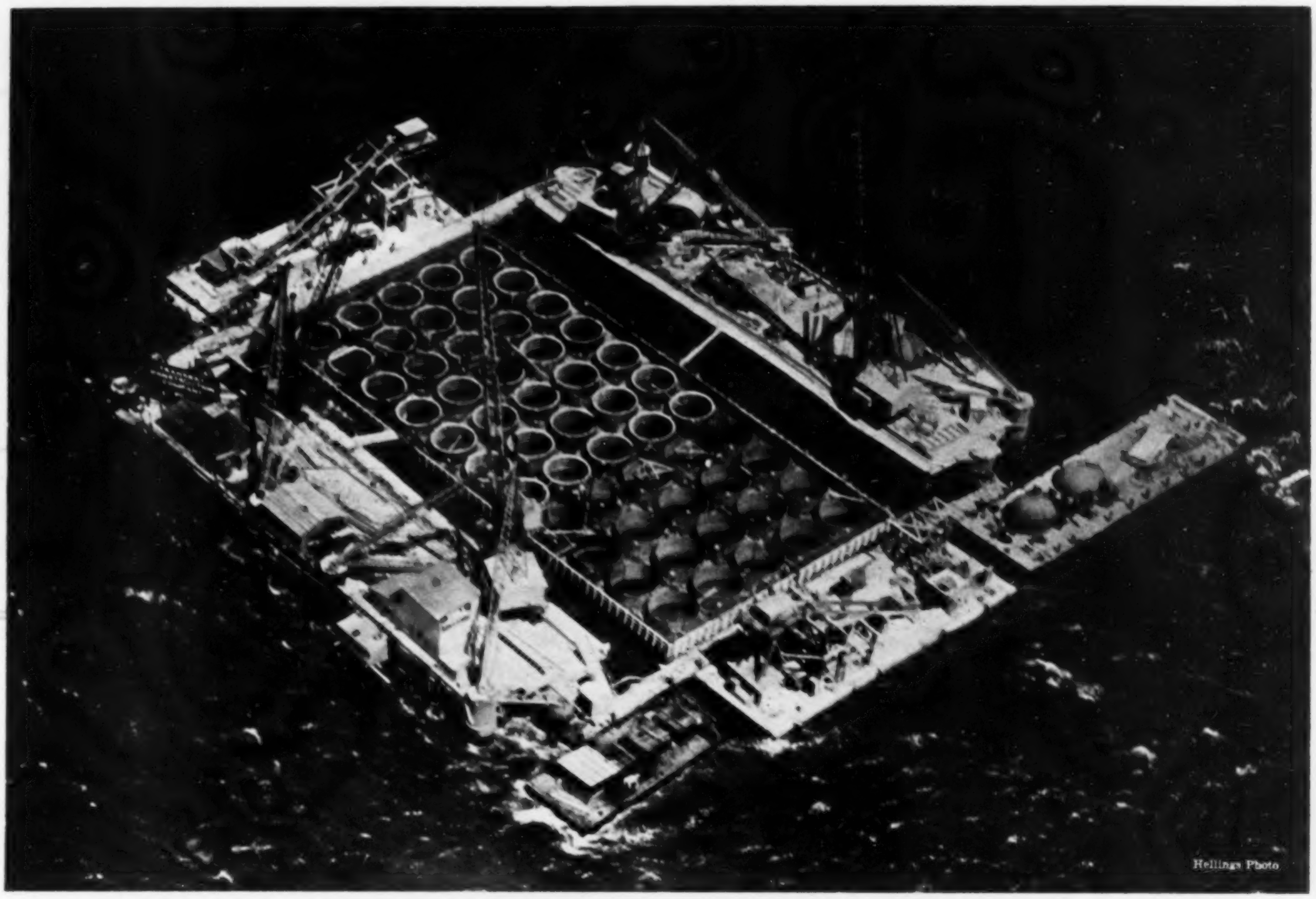
OVERFLOW WEIR for Arizona spillway of Boulder Dam nears completion. View shows installation of vertical drum gates and piers built for U. S. Bureau of Reclamation by Six Companies Inc. Spillway has 400-ft. weir crest and 700-ft. overall length.

NEW POST-OFFICE DEPARTMENT BUILDING in Washington, D. C., is dedicated June 11 by Postmaster General James A. Farley. Eight-story structure completed by McCloskey Co., general contractor, of Philadelphia, and S. M. Siesal Co., of Milwaukee, subcontractor for stone work, at cost of $11,000,000, is 750x320 ft. in plan and has steel frame faced with limestone backed up with brick.

HIGH STEEL VIADUCT weighing 1,226 tons, carrying Calvert St. across Rock Creek Park, Washington, D. C., is moved 80 ft. south to new temporary location in 8 hr. by five horses and two men operating capstans. Bridge, 750 ft. long, has five steel towers with maximum height of 125 ft. During construction of new triple-arch concrete bridge at old location, steel viaduct will serve as detour for vehicular and street-railway traffic. John Eichleay Jr. Co., of Pittsburgh, moved bridge for general contractor, John W. Cowper Co., of Buffalo and Washington.

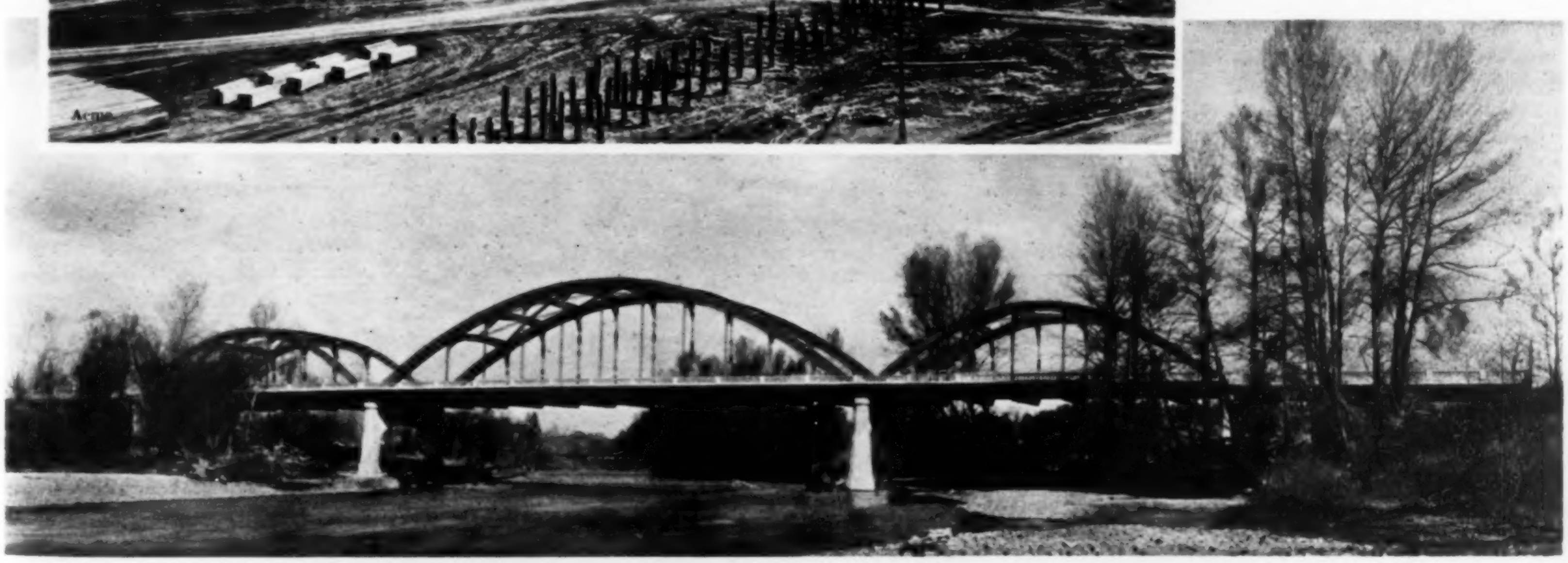


COFFERDAM 400x1,400 ft. in plan at site of General Joe Wheeler dam, Tennessee Valley Authority project, encloses site for power-house foundation which is now being excavated. Extending outstream is second section of cofferdam, with dimensions of 200x1,200 ft., formed from spoil removed from first section.



CAISSON FOR CENTER ANCHORAGE PIER of San Francisco-Oakland Bay bridge, for which C. H. Purcell is chief engineer, reaches harbor bottom, extending down into rock 205 ft. below water surface. Sunk by Daniel E. Moran's compressed-air-flotation method, the caisson, 100x200 ft. in plan, is equipped with 55 dredging wells, each 15 ft. in diameter. Wells are covered with steel domes to retain compressed air during flotation and sinking operations. In this view domes have been removed, air has been taken off and dredging is in progress by clamshell buckets and four stiff-leg derricks. Contractor, Transbay Construction Co.

PRELIMINARY WORK AT FORT PECK DAM. *(Left)* Bridge across Missouri River near Glasgow, Montana and railroad line are being built to aid construction of $60,000,000 Government project for river regulation and flood control under direction of Major T. B. Larkin, Corps of Engineers, U. S. Army. The dam will be a hydraulic fill structure 230 ft. high with a crest length of 3½ mi., involving the placing of about 75,000,000 cu.yd. of earth.



WINS AWARD FOR BEAUTY. In class of structures built during 1933 at cost of less than $250,000, the Dr. John D. McLaughlin bridge over Clackamas River, at Portland, Ore., receives first prize in annual contest sponsored by American Institute of Steel Construction. The bridge was fabricated and erected by Poole & McGonigle for the Oregon State Highway Commission.

THREE CABLEWAYS, centered over lock walls, deliver most of 250,000 cu. yd. of concrete required for pair of locks in 5-yd. bottom-dump buckets.

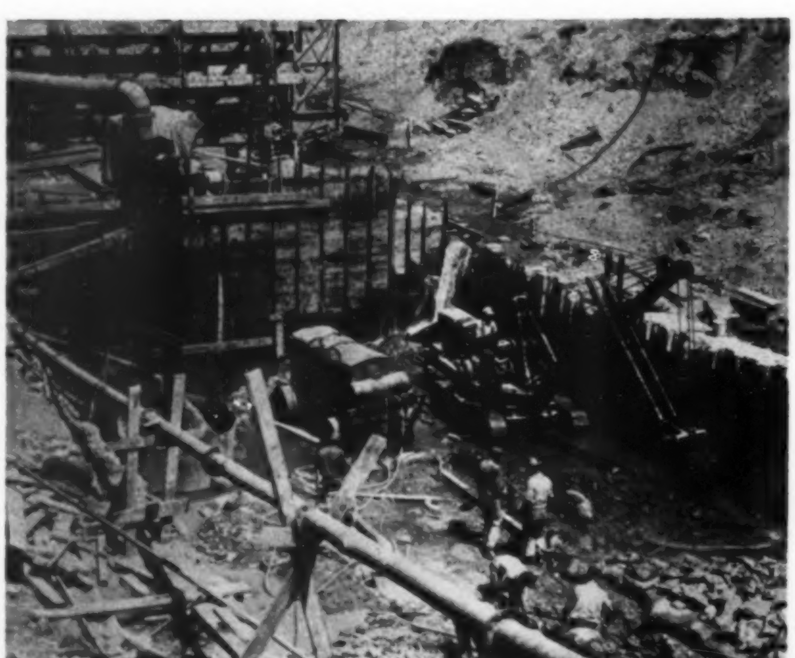
THREE CABLEWAYS

of 1,510-Ft. Span Place 250,000 Yd. of Concrete in

MONTGOMERY ISLAND LOCKS

THREE CABLEWAYS of 1,510-ft. span have placed concrete and moved equipment and materials for a pair of locks being completed by the Booth & Flinn Co., of Pittsburgh, under the direction of the Corps of Engineers, U. S. Army, in the Ohio River at Montgomery Island, 4 mi. below Beaver, Pa. This installation is believed to be the first application of cableways to the direct placement of concrete in the construction of locks or dams on the Ohio River watershed. In conjunction with the cableways, the contractor put into service a new type of 5-yd. manually discharged concrete bucket. Using these buckets, which were filled with concrete at a central mixing plant containing two 2-yd. mixers, the cableways placed as much as 25,143 yd. of concrete in a month, setting what the engineers considered a new record for Ohio River locks and dams. Construction of the locks has progressed satisfactorily in spite of delays caused by floodings of the cofferdam and by the severe winter of 1933-34.

Structural Dimensions—Construction of the two locks at Montgomery Island preceded the letting of a contract for the Ohio River third fixed dam at this point. A contract for the dam was awarded to the Booth & Flinn Co. near the end of the year, and construction of the first section now is well under way. The new dam (of the lift-gate type) will supersede existing dams 4, 5 and 6 upstream, increasing the distance between lockages and reducing delays to navigation. The locks, which now are practically completed, consist of an inner lock 600 ft. long x 110 ft. wide and an outer lock 360x56 ft. in size.



FOUNDATION EXCAVATION for land wall employs pneumatic tools, portable compressor, small power shovel, vertical pump, and walls of interlocking steel sheetpiling.

Concrete footings, which are in general 35 ft. wide and about 30 ft. deep, resting on solid rock, support the walls of the lock chambers. These walls are 24 ft. thick at their bases and rise about 42 ft. above the footings. Their lengths are: land wall, 1,119½ ft.; middle wall, 968½ ft.; and river wall, 619¼ ft. The middle wall has a constant thickness of 24 ft., but the land and river walls reduce to 10-ft. width at their tops. Each wall contains two conduit tunnels for water.

More than 3,000 wood piles, 29 to 36 ft. long, carry the guide and guard walls at the upper and lower ends of the locks. These walls range in height from 40 to 48 ft. The guide walls are

AFTER UNWATERING COFFERDAM *(above)*, five power excavators remove sand and gravel from lock wall foundations.

SAND AND GRAVEL FILL *(left)* for downstream end of cofferdam wall is placed by floating derrick from inside structure.

21 ft. thick at the base and are more than 400 ft. long. Lengths of the guard walls, 18 ft. thick at the base, are 357 ft. at the upper end of the lock and 283 ft. at the lower end.

Between the lock walls, at the upstream and downstream ends of the chambers, are massive concrete sills for the lock gates and for emergency dams to be used when making repairs to the gates. The largest pair of these sills, at the upper end of the 110-ft. lock, required almost 14,000 yd. of concrete. A concrete slab floor 2 ft. thick is placed on earth fill over the bottom of each lock chamber.

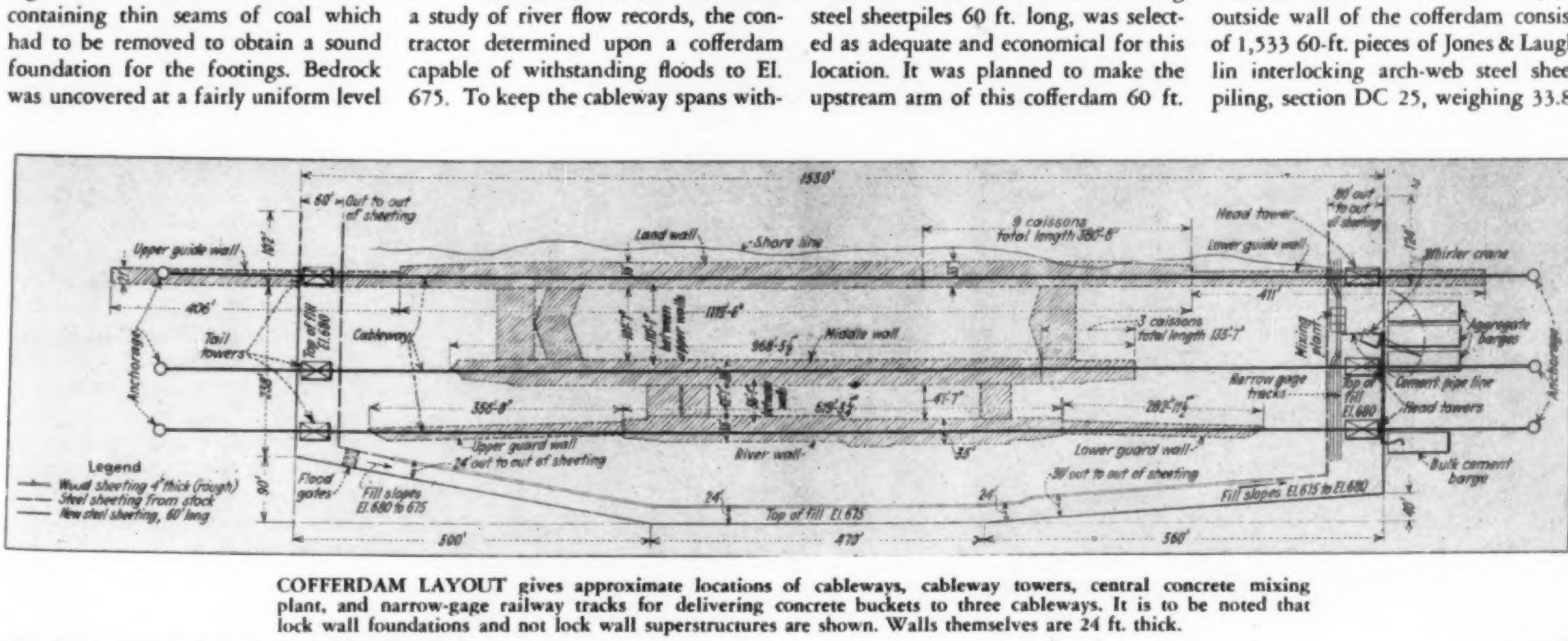
Quantities—Excavation inside the cofferdam was estimated to total 334,000 yd. of earth and 20,000 yd. of rock. About 150,000 yd. of sand and gravel was removed by dredge before the cofferdam was closed. The overlying rock formation consists of shale containing thin seams of coal which had to be removed to obtain a sound foundation for the footings. Bedrock was uncovered at a fairly uniform level over the entire area. Total concrete requirements were about 250,000 yd.

General Construction Plan—Normal pool level at the site is El. 662.6, and the flood stage established by the contract is 8 ft. above this level, or El. 670.6. Bedrock occurs at El. 620. After a study of river flow records, the contractor determined upon a cofferdam capable of withstanding floods to El. 675. To keep the cableway spans within reasonable limits, the inside length of the cofferdam was established at 1,390 ft., which was sufficient to inclose all structures except portions of the upper and lower guide walls.

A cofferdam of Ohio River box type, with an outside wall of interlocking steel sheetpiles 60 ft. long, was selected as adequate and economical for this location. It was planned to make the upstream arm of this cofferdam 60 ft. wide to serve as a base for the tail towers of the three cableways and to employ a greater width of 80 ft. for the downstream arm, on which the head towers and the concrete mixing plant were to be erected. Extensive experience in using cableways on concrete arch bridges led the contractor to request and obtain permission from the engineers to apply this equipment to building the locks.

Cofferdam—As shown by the plan, the river wall of the cofferdam is 24 ft. wide, with the exception of a section about 425 ft. long at the downstream end which has a width of 30 ft. Sand and gravel fill was placed in the river wall to El. 675. In the upstream and downstream arms of the cofferdam the height of the fill was increased to El. 680, on a level with the top of the outside wall of steel sheetpiling.

From shore line to shore line, the outside wall of the cofferdam consists of 1,533 60-ft. pieces of Jones & Laughlin interlocking arch-web steel sheetpiling, section DC 25, weighing 33.85



COFFERDAM LAYOUT gives approximate locations of cableways, cableway towers, central concrete mixing plant, and narrow-gage railway tracks for delivering concrete buckets to three cableways. It is to be noted that lock wall foundations and not lock wall superstructures are shown. Walls themselves are 24 ft. thick.

lb. per linear foot of pile and 25 lb. per square foot of wall. As indicated by the drawing, the inside wall of the upstream and downstreams arms is made up of interlocking steel sheet-piles (25 to 48 ft. long) from the contractor's own stock, and the inside sheeting of the river wall consists almost entirely of 3-in. wood planks 24 and 20 ft. long. The cofferdam was designed with timber wales and tierods as required, in accordance with accepted box-type construction.

Pumps — A pump boat equipped

CABLEWAY HEAD TOWERS and central mixing plant rest on wide downstream arm of cofferdam. Concrete bucket of 2-yd. capacity, suspended in foreground, is used for lighter sections.

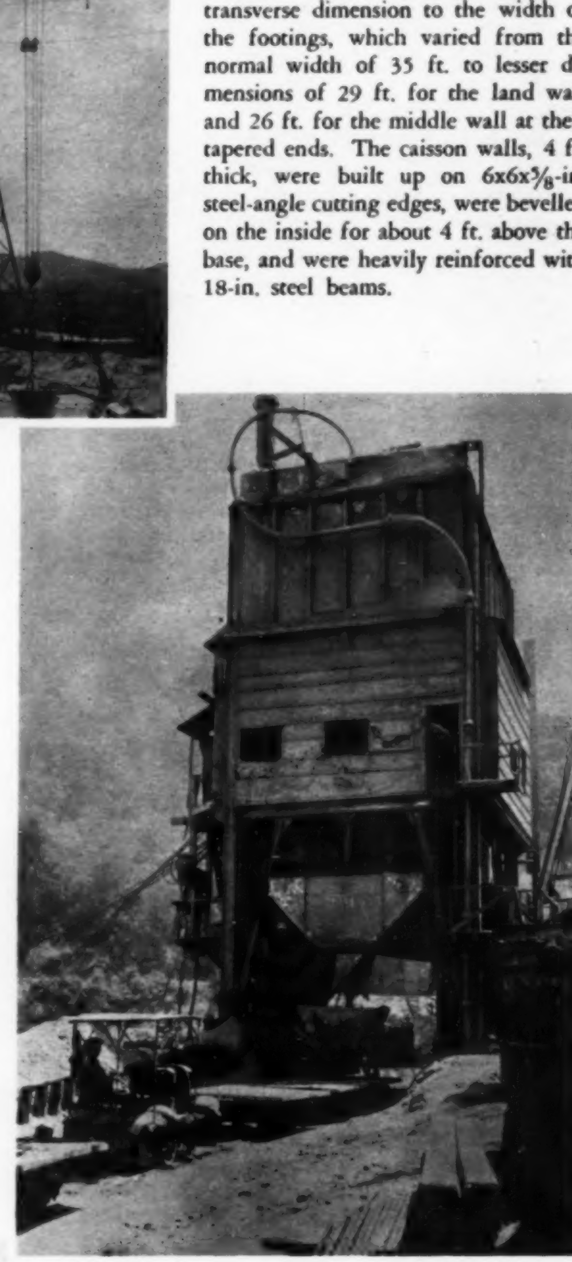
FOR CAISSON WALLS and similar thin sections, contractor places concrete with 2-yd. concrete bucket.

with two 18-in. steam-driven units unwatered the cofferdam. Following the initial unwatering, the cofferdam has been kept dry and has been pumped out after each flooding by seven electric-motor-driven pumps, six of the vertical type and one a horizontal centrifugal unit. In addition to these pumps, the contractor used six electric-motor-driven 6-in. vertical pumps which could be suspended inside caissons. The voltage of all pump motors was stepped up from 220 to 440 to reduce the voltage drop with a heavy load on the power line.

Excavation—Preliminary excavation of 150,000 yd. of sand and gravel was carried on inside the cofferdam by a bucket-chain dredge of the McCrady-Rodgers Co. Material excavated by the dredge was dumped upstream from the locks. After the cofferdam had been closed and unwatered, excavation was continued by a battery of five P&H excavators. Spoil was handled by the cableways and by trucks and was stored at the downstream end of the cofferdam to be used later in making 183,000 yd. of fill.

Rock excavation, including the cutting of key trenches in solid rock, was carried on by drilling and blasting, using Ingersoll-Rand drills, furnished with air by Sullivan or Gardner-Denver portable compressors, and 40 per cent gelatin dynamite. Blasted rock was loaded into skips by a small Michigan power shovel or by hand and was disposed of by cranes alongside the excavation.

Caissons—To speed up the construction of wall footings, the contractor sank nine open concrete caissons at the downstream end of the land wall and three caissons at the lower end of the middle wall. These caissons averaged about 40 ft. long and were equal in transverse dimension to the width of the footings, which varied from the normal width of 35 ft. to lesser dimensions of 29 ft. for the land wall and 26 ft. for the middle wall at their tapered ends. The caisson walls, 4 ft. thick, were built up on 6x6x⅜-in. steel-angle cutting edges, were bevelled on the inside for about 4 ft. above the base, and were heavily reinforced with 18-in. steel beams.



CENTRAL MIXING PLANT is equipped with two 2-yd. mixers and conveying system for delivery of bulk cement from barges.

CAISSON CONSTRUCTION replaces ordinary excavation at lower end of land wall, where contractor sinks nine reinforced-concrete caissons, averaging about 44 ft. long, to bedrock.

Cranes and derricks excavated with clamshell buckets inside the caissons until the cutting edges reached shale. The remainder of the excavation was taken out by hand, using pneumatic tools to drill and break the rock and suspended vertical pumps to keep the holes dry. Broken rock was loaded into clamshell buckets or skips for disposal by the cranes.

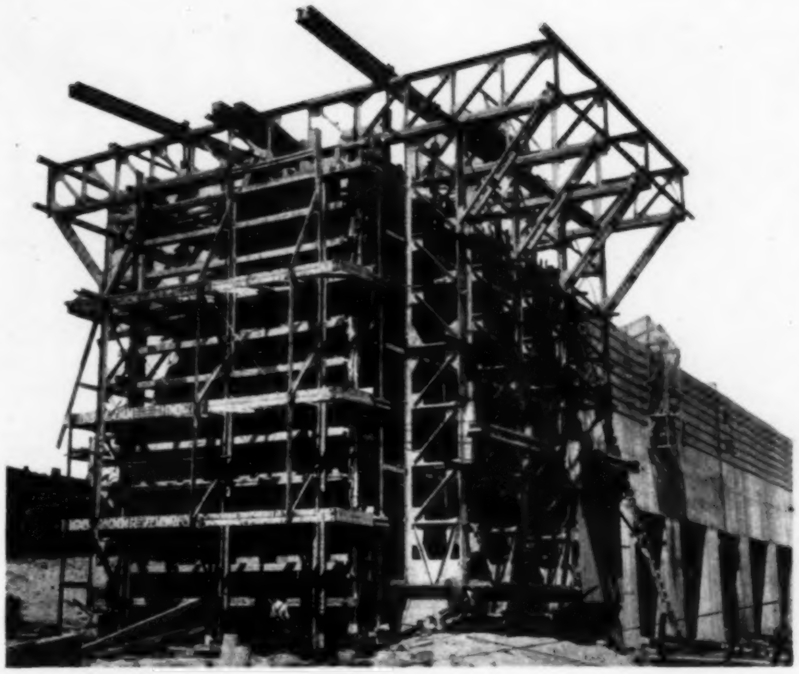
Cableways—Each of the three cableways is equipped with a Lidgerwood steam hoist engine having one drum on which is wound 2,800 ft. of ¾-in. wire-rope load line and another drum of equal diameter for operating a ¾-in. endless hauling rope. These drums give a single-line speed of more than 2,500 ft. per minute, which provides a hoisting speed of more than 500 ft. per minute on the lift block of the five-part hoisting falls.

Cableway sheaves and trolley carriers are Lidgerwood equipment, and the

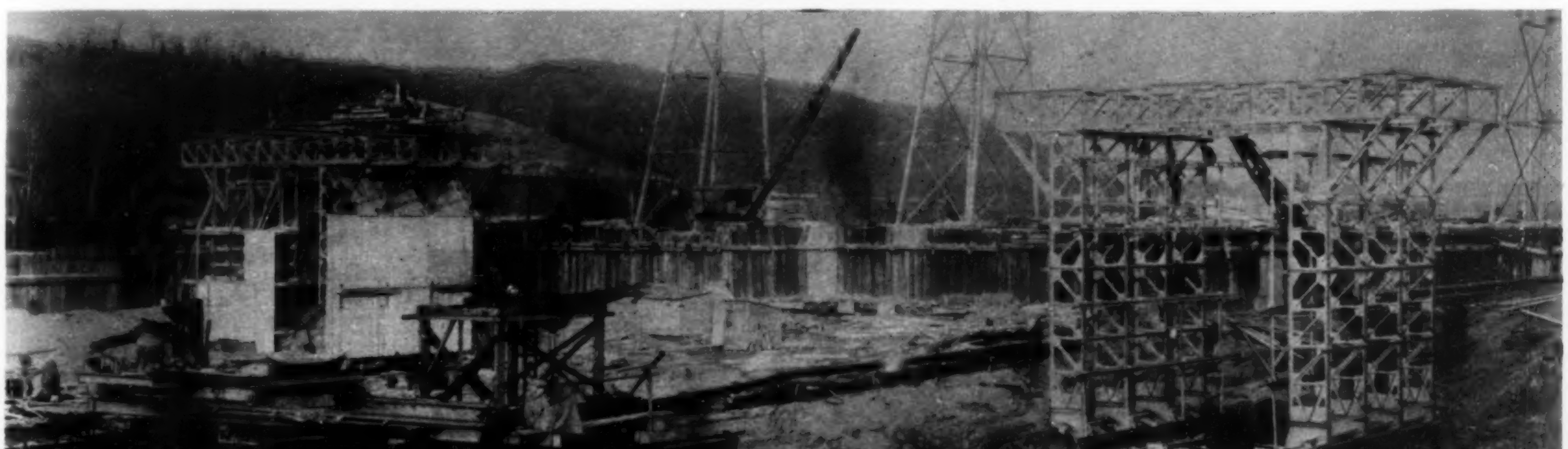
cables are Hercules red strand wire ropes, used previously at the George Westinghouse bridge, East Pittsburgh, Pa. Track cables above the river and middle walls are 2¾ in. in diameter, and the cable above the land wall is 2½ in. in diameter. Each cableway has a capacity of 25 tons.

New steel towers were designed for the cableway installation. The three head towers, on the downstream arm of the cofferdam, are 150 ft. high, and the tail towers, on the upstream arm, are 110 ft. high. Each tower is guyed by a 1½-in. backstay line to a 2½-in.-diameter wire-rope sling around a circular steel sheetpile anchorage. The cableways have a natural sag of about 70 ft., which increases to a maximum of about 85 ft. under full load.

In addition to the hoist for operating the cableway, the engine house at the head tower of each unit contains a second steam hoist which can be used to pull a drag scraper bucket suspended from the load line of the cableway. Operations performed by the cableways include erection of steel gantry forms for the walls, setting pumps, backfilling, placing concrete, and handling miscellaneous material. They have proved particularly useful in times of flood for quickly lifting and removing pumps from the cofferdam.



GANTRY TRAVELER running on 85-lb. rails carries forms for wall sections 42 ft. high and 48 ft. long. Portion of upper guard wall appears beyond forms.



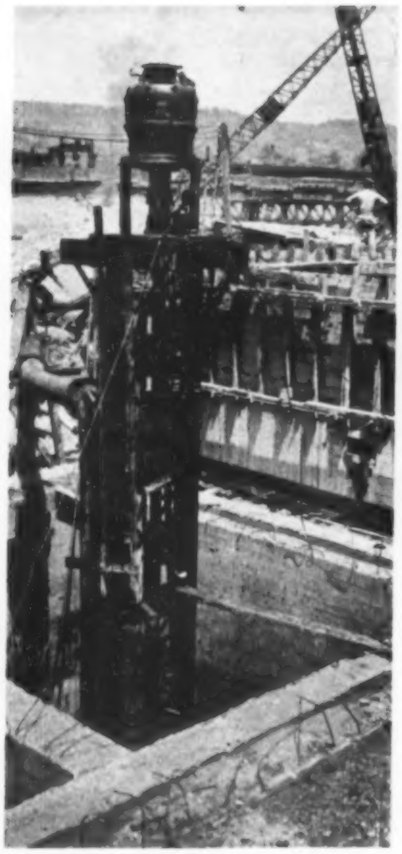
LOCK-WALL CONSTRUCTION within cofferdam. Two sections of gantry travelers for lock walls are being erected. In foreground is gantry traveler for wall footing, inclosed in wood sheathing and canvas as protection against winter weather.

Mixing Plant—Concrete is mixed at a central plant on the downstream arm of the cofferdam and is dumped into buckets on narrow-gage flat cars which are moved under the cableways by gasoline locomotives. The plant has two electric-motor-driven Rex 2-yd. concrete mixers, materials for each of which are weighed by separate Blaw-Knox batching equipment. All concrete ingredients are received by barge and are stored in Blaw-Knox 200-yd. steel overhead bins divided into four compartments for cement, sand, and two sizes of gravel. The two gravel sizes are ¼ in. to 1½ in. and 1½ in. to 5 in. Bulk cement is conveyed from barges to the elevated bin by a Fuller-Kinyon pumping system, utilizing a 4-in. pipe line.

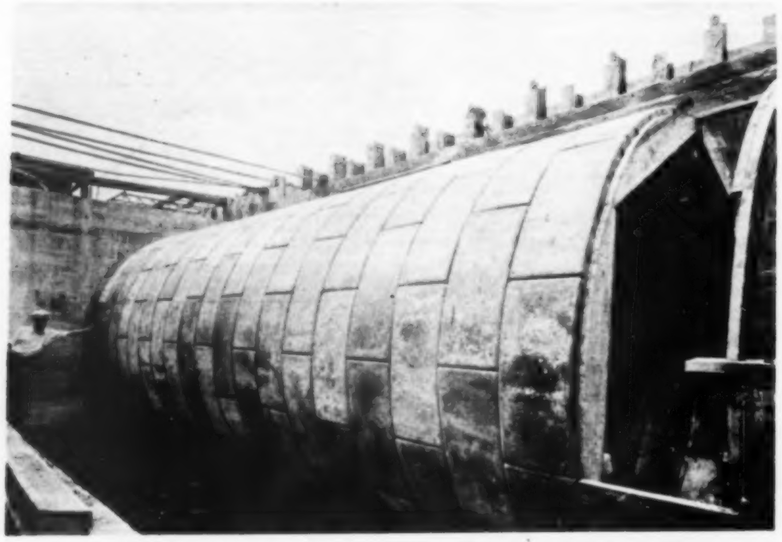
Concrete—Forms for the lock-wall footings and lock walls were mounted in Blaw-Knox steel gantry travelers 48 ft. long. At the start, the job was equipped with three gantry forms for the footings, 30 ft. high, and two forms for the upper walls, 42 ft. in height. As the footings approached completion the contractor utilized two of the lower forms to make an upper form. The gantries were equipped with flanged-wheel trucks which rolled forward on 85-lb. rails.

Buckets of mixed concrete are picked up by the cableways from the industrial railway flat cars. When placing concrete in large blocks the practice has been to use 5-yd. buckets delivering 4½ yd. per trip. These buckets were designed for rapid discharge and for maximum safety in operation. When a workman trips the discharge lever, the weight of the concrete opens the gate, which then will not close until the bucket is set down. This feature aids rapid and complete discharge of the contents. Originally, the 5-yd. buckets were equipped with radial gates. After half the concrete had been placed, roller gates were substituted because of their easy opening and closing action.

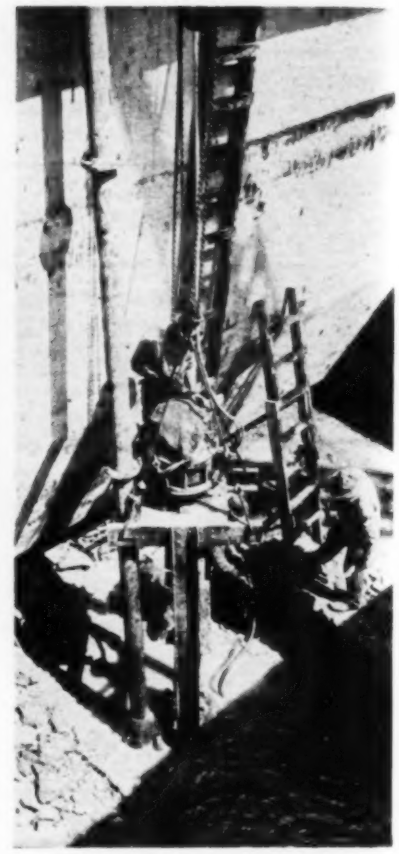
Concrete in structures at some distance from the cableways often was placed by attaching hauling ropes to the buckets and pulling them as far as desired to one side with a tractor. The contractor followed this practice in concreting the sills of the 360-ft. locks. Steel stiff-leg derricks were employed to place the concrete in the sills of the 600-ft. lock, which is twice as wide as the 360-ft. lock. For thinner concrete sections, such as the walls of the caissons, the contractor employed



VERTICAL 12-IN. PUMP with capacity of 5,000 g.p.m. lifts water from sump inside caisson sunk to final grade.



CIRCULAR LINING of bolted Truscon steel plates forms mold for casting concrete around 11-ft.-diam. culvert. Steel liner plates are used for 280 lin.ft. of full-circle culvert and 320 lin.ft. of half-circle culvert.



SUSPENDED 6-IN. PUMP inside reinforced-concrete caisson keeps bottom dry during sinking to bedrock foundation.

2-yd. bottom-dump buckets handled by the cableways.

Backfilling—Material for backfilling on both sides of the lock wall footings was handled in skips by the cableways, which dropped earth on traveling platforms with sloping sides, running on top of the footings. These sloping platforms divided the loads and discharged the fill to the two sides of the wall. Backfill behind the land wall was hauled from the downstream end of the cofferdam in narrow-gage side dump cars by two Vulcan 18-ton steam dinkeys.

Night Lighting—To illuminate the job for night operations, the contractor used 20 National X-ray reflectors of 500- and 1,000-watt capacity. Poles and standards for mounting these floodlights were provided at frequent intervals around the cofferdam, and the units were set up on those parts of the project where night work was in progress.

Floods—On March 14, 1933, the Ohio River reached the highest stage in 20 years, the gages at the site of the lock giving an elevation of 691.5, about 12 ft. above the top of the steel sheet-piling in the outer wall of the cofferdam. At two later dates, April 12 and May 10, the river rose to lower stages which topped the cofferdam. Two other crests in the spring of 1933 exceeded flood stage, El. 670.6, but did not flood the cofferdam.

Each time that it was necessary to flood the cofferdam, water was admitted through a sluice provided for that purpose near the upstream end of the river wall. None of the floods

NORMAN McLEOD *(left)*, superintendent for Booth & Flinn Co., and DON P. KEELOR, resident engineer for Corps of Engineers, U. S. Army.

COFFERDAM FLOODED by high water early in 1933. Tail towers and gantry traveler rise above swollen river.

caused any damage to the cofferdam. Pumping equipment on hand was adequate to unwater the coffer in about 8 days after each flood had receded. Little time was lost in cleaning up the mud left by the flood and resuming full working schedule.

Progress—Floods and the extremely cold winter of 1933-34 caused greater delay than had been expected for these seasons and resulted in actual progress falling behind the contractor's schedule. This lag will be taken up at the present rate in time to complete the work at an early date.

Concreting went forward at a good average rate during 1933, the progress for each month being dependent upon the size of the structures which were ready to receive concrete. Concreting started October 15, 1932, and by Aug. 28, 1933, 150,000 yd. had been placed. In January, 1933, the monthly record of 25,143 yd. was made.

Administration—Major W. D. Styer, district engineer, Pittsburgh, is in charge of the design and construction of the locks for the Corps of Engineers, U. S. Army. W. L. Kuehnle, engineer, directs all engineering activities in the field, and Don P. Keelor is resident engineer.

For the Booth & Flinn Co., A. Rex Flinn is president. George Hockensmith, vice-president and general superintendent, exercises general supervision over the project, which is being constructed under the immediate direction of Norman McLeod, superintendent, with M. W. Murphy as assistant superintendent and R. T. Furr as field engineer.

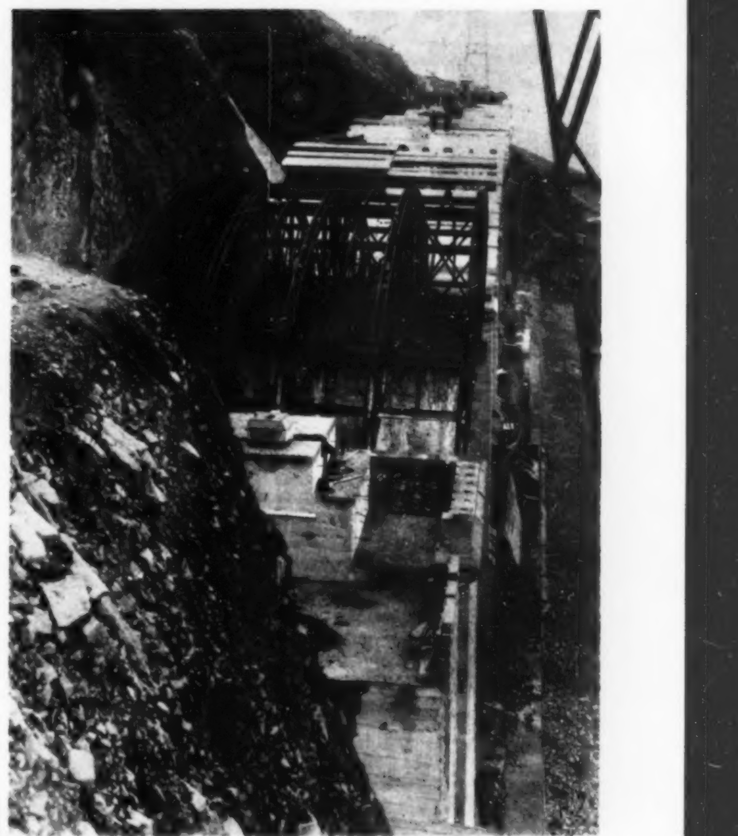
RELOCATED HIGHWAY

Clings to Welsh Cliffs

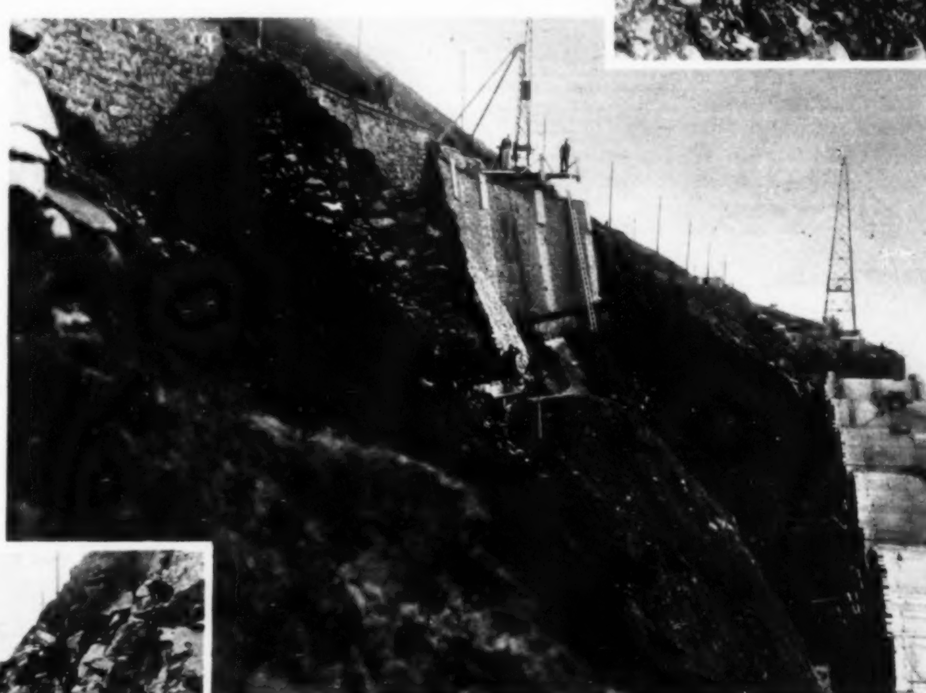
TO IMPROVE the grades, alignment and width of the Holyhead main road along the headlands of North Wales bordering the Irish Sea, a new highway involving much heavy cliffside construction is being built. In general, the new road is located below the old route and above the tracks of the London, Midland & Scottish Railway to Holyhead. The new highway requires heavy retaining walls, rock tunnels, and a tall reinforced-concrete multiple-arch viaduct parallel with a smaller viaduct carrying the railway tracks. Accompanying photographs illustrate the work in progress at a rock point called Penyclip.

When completed, the new highway will have a 27-ft. roadway, a 5-ft. sidewalk on the north side, and a 2-ft. sloping shoulder on the south side. This last feature provides clearance to keep overhanging vehicles from fouling the parapet wall when they are against the curb. The sloping surface is to discourage pedestrians from using it.

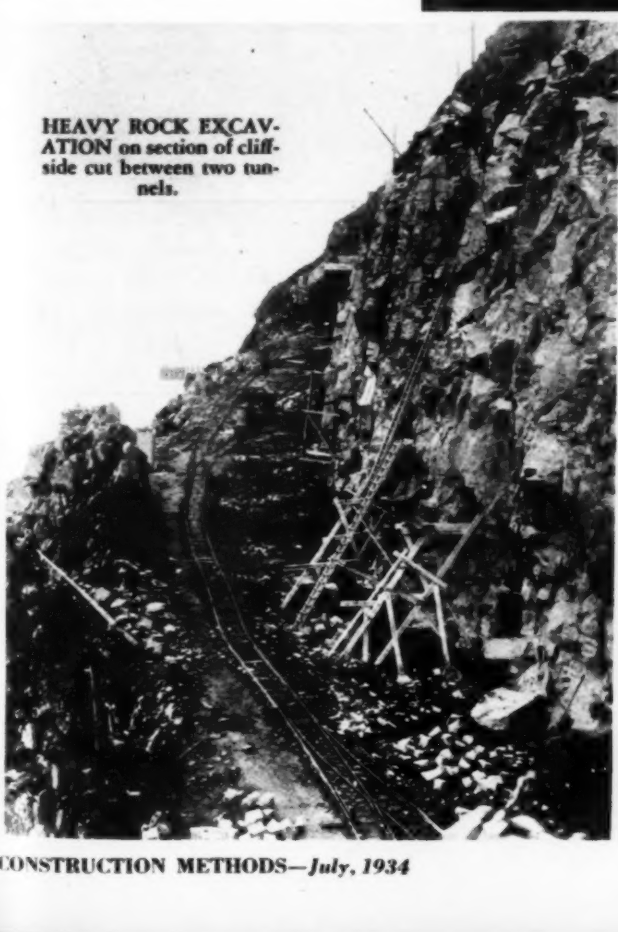
Rigorous safeguards are employed to prevent disturbance of the roadway above or damage to the railway below, during construction. To protect the railway from falls of material dislodged above, on sections where no blasting is being done, the builders construct heavy fences of wire-mesh reinforcement attached to steel-rail posts embedded in concrete. In addition, a railway watchman is on duty during working hours to block the section in case of accident.



CENTERING IN POSITION for arches of high viaduct carrying portion of new Holyhead road along coast or North Wales.



STEEP SLOPES behind viaduct cause slides resulting in eventual collapse of one pier during construction. Retaining walls on upper hillside support old roads.



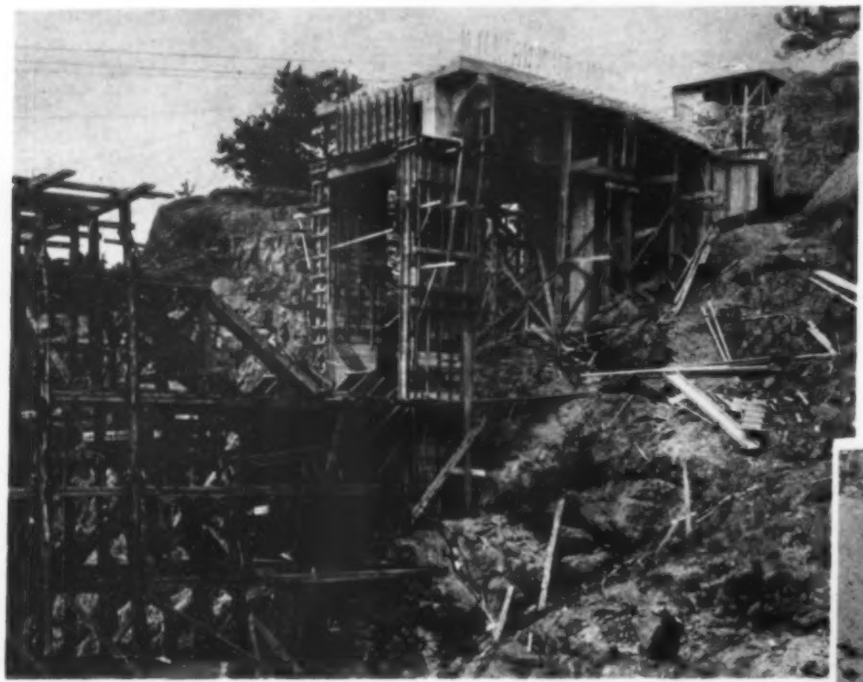
HEAVY ROCK EXCAVATION on section of cliffside cut between two tunnels.

HIGH MULTIPLE-ARCH VIADUCT *(below)* and heavy retaining walls feature construction of modern highway between old road above and railway beneath.

Blasting precautions are more elaborate. Before a round can be fired, the railway section must be blocked. Only then does the railway foreman hand over to the tunnel foreman a heavy brass disk marked "Fire the Shot." The railway has issued special regulations to govern blasting and has notified the contractors' foremen and all others concerned of the severe penalties for disregard of these regulations—the penalties including life imprisonment.

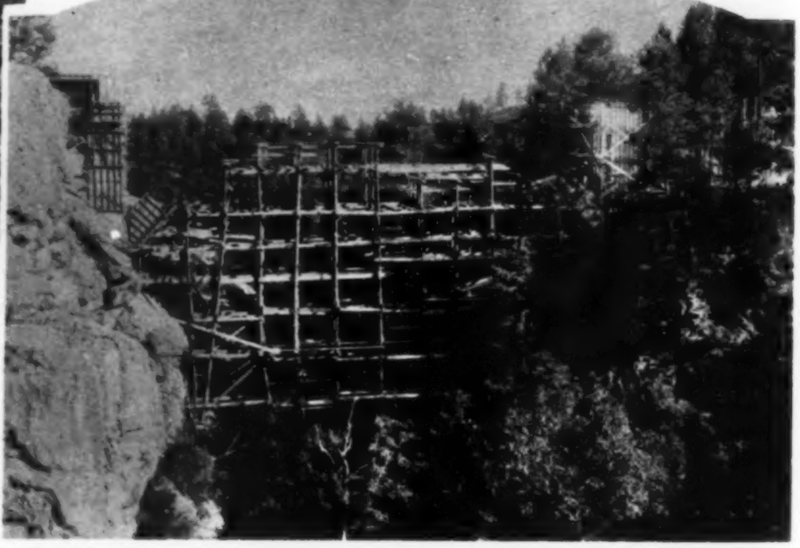
An old 8x8-ft. tunnel lined with dry stone masonry was uncovered under one part of the existing road. This tunnel has now been filled. Howard Humphreys & Sons are the consulting engineers.

Doweled Timber Falsework



Supports Concrete Arch in North Dakota

By MORRIS E. ADELSTEIN
Northwestern Engineering Co., Rapid City, S. D.



CURVED APPROACH at north end of bridge connects concrete arch with rock walls of canyon. FALSEWORK of doweled posts *(right)*, built up from streambed 125 ft. below, supports forms of concrete arch.

SOUTH DAKOTA'S first concrete-arch bridge was built by the Northwestern Engineering Co., of Rapid City, S. D., for the State Highway Commission under the supervision of J. Harper Hamilton, state bridge engineer. The structure is an open-spandrel reinforced-concrete arch with the longest concrete span in the state—120 ft. Crossing Beaver Creek 12 mi. north of Hot Springs at an elevation 125 ft. above the stream, this bridge also is the highest structure in the state. Reinforced concrete approaches of 100 ft. and 60 ft., on the south and north ends respectively, connect the arch deck with the solid rock walls of the canyon.

Solid rock had to be excavated for the haunch foundations. Because of the difficulty of removing the hard rock for the footings, the rock was blown into the canyon, whence it had to be removed later by a hoist to prepare proper bearings for the falsework.

Arch Falsework — Accompanying these notes are photographs which show details of the methods used in erecting the bridge. The falsework was constructed with pine logs, obtained locally, varying in length from 24 ft. to 50 ft. These logs were lowered by a hoist block traveling on a rope tramway which was anchored into both banks of the ravine. The track cable was a ¾-in. plow-steel rope attached at each end to a 1-in.-diam. steel eye embedded in a 1-cu.yd. block of concrete. Many of the logs weighed several tons.

These logs were held in place by 1¾-in. steel dowels which were set into solid rock and driven into the bottom of the logs for about 18 in. Each log, wherever possible, was set in a true vertical position; the top was cut off square and another dowel inserted into the top, the second dowel projecting into the pile above. These dowels gave the falsework the required rigidity.

In addition, the entire falsework was braced and cross-braced with 3x12-in. bridge planks bolted in place. All bolts were ¾ in. in diameter, with malleable washers on both ends. Because bolts were used throughout, it was easy to dismantle the falsework. Very little damage was done to the bridge planks. In fact, these planks, which were freshly milled when placed in the structure, came out thoroughly seasoned with

MIXING PLANTS *(left)* at both ends of arch deliver concrete simultaneously by chutes to rib, which must be cast monolithically.

practically no depreciation, except for a few ¾-in. holes.

Long before they were actually needed, all forms for the bridge were made up of selected lumber. To avoid warping, the forms were oiled immediately upon completion and were kept under cover of a tent until needed.

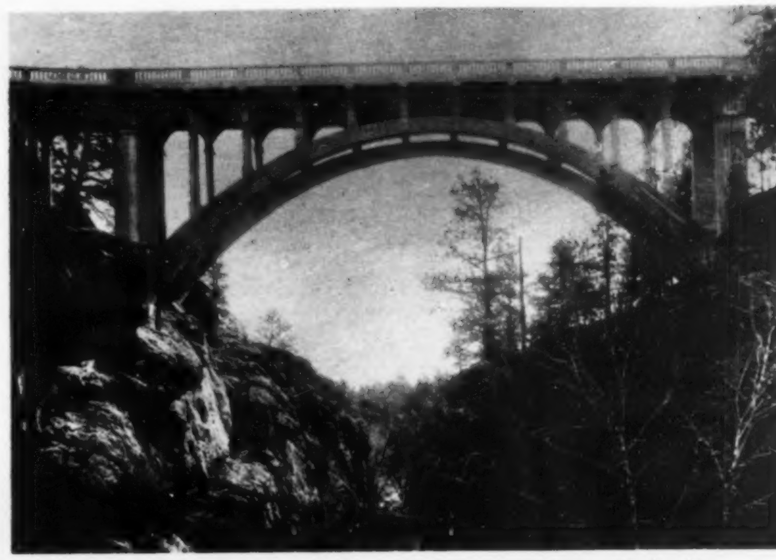
Concreting Procedure — Because of the depth of the canyon, it was necessary to travel 12 mi. to get from one side of the bridge to the other. Consequently, it was desirable that two separate mixing plants be placed on the project to work the job from both ends, as illustrated by one of the photographs.

All rock aggregate was quarried from the local hills, brought to the job, crushed and placed in stockpiles. Sand was shipped from a pit at Orno, S. D., to Pringle and was hauled to the site. Water was furnished to the mixers by a Bulldozer pump, placed in the creek below, with a two-way pipe system which conducted water to either side of the structure or to both sides at the same time. The water had to be pumped against a head of 135 ft. A combination of rubber hose and black iron pipe was used in the line.

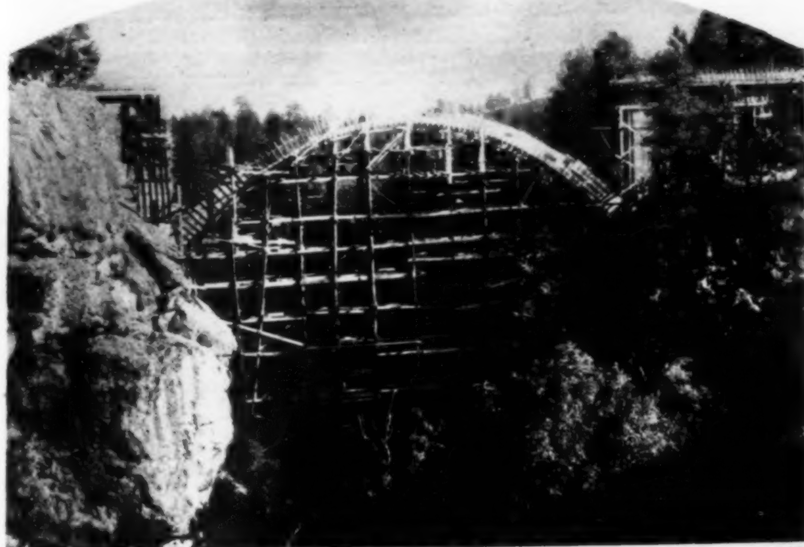
Whenever possible, concrete was placed by chutes. Because the specifications required that each rib of the arch be placed in one pour, some of the work had to be done at night. A satisfactory lighting system was arranged with old-fashioned gasoline torches. As each load of wet concrete was placed upon the falsework, careful observations were made to see if any settlement occurred. None was noted. Construction of the bridge was accomplished in 5 months. The quantities contained in the structure are 440 cu.yd. of concrete and 63,310 lb. of reinforcing steel.

It will be noted that the approaches of the bridge are built on reverse curves. This layout exposes the open-spandrel arch to observation by traffic approaching from either side. The handrail forms for the curved approach portions of the bridge were built straight and were brought into position by the use of 37 1-ton screw jacks. These jacks both pushed and pulled the forms into place, to conform to the curve of the approaches.

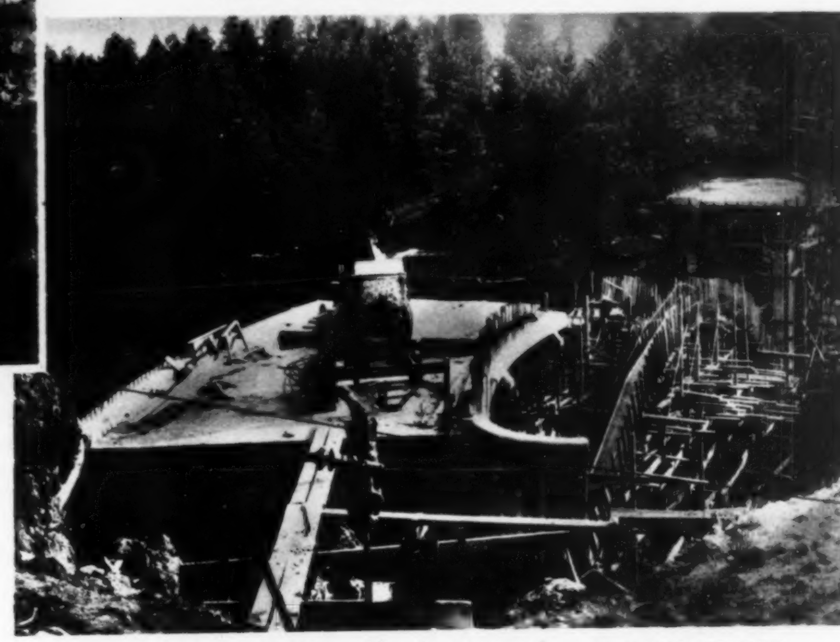
An average crew of 20 men was employed in the construction of the bridge. In spite of the fact that the bridge rises 125 ft. above the flow line, not a single accident occurred during its construction.



FIRST CONCRETE ARCH in South Dakota crosses Beaver Creek with span of 120 ft. Bridge deck is 125 ft. above stream.



RIB FORMS are erected on timber falsework. All forms are made up, oiled and stored in advance of use.

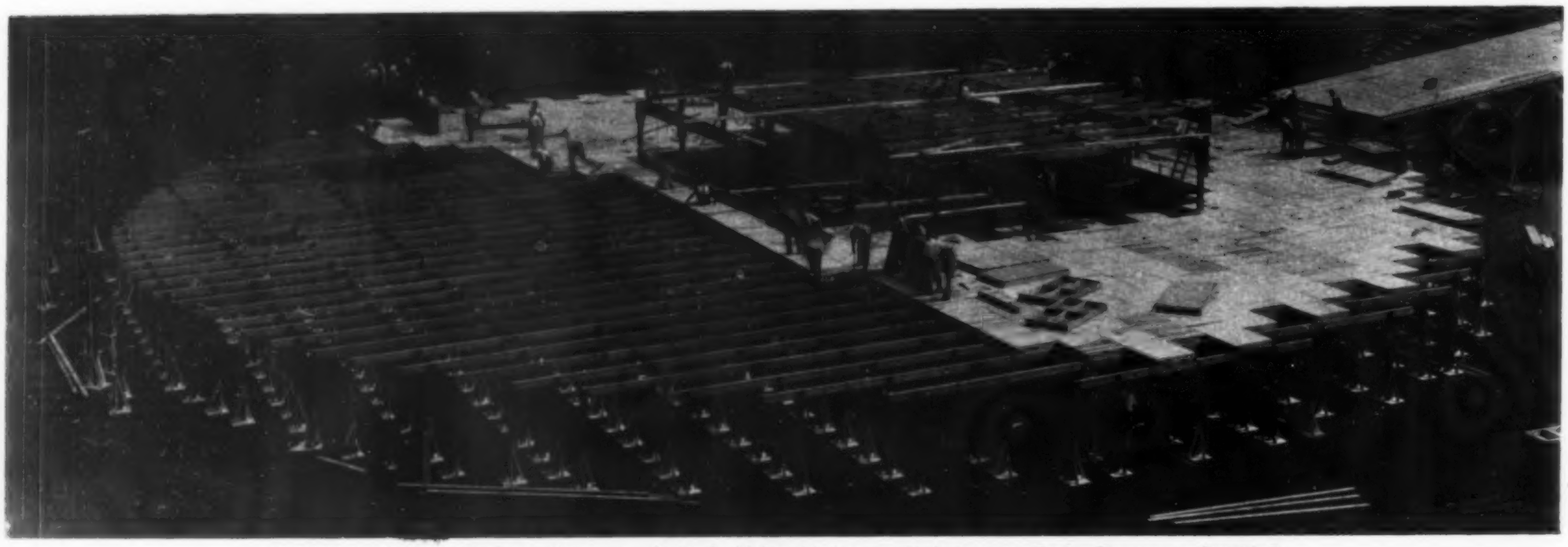


CONCRETE ARCH provides short tangent between reverse curves on approaches. Forms for cast-in-place handrails on approaches are built straight and forced into place with screw jacks.

RIBS AND COLUMNS COMPLETED *(below)* and deck construction in progress. Bolted falsework is easily dismantled.

PREFABRICATED TIMBERS

Speed Erection of Huge Stage



CIRCULAR STAGE 150 ft. in diameter and 8½ ft. high, with inner raised stage 75 ft. in diameter and 16½ ft. high, is assembled of prefabricated timber members in less than 2 days by large force of carpenters and laborers.

SHOP-FABRICATED wood members cut to length, drilled, and nailed to form individual units for erection enabled a large crew of carpenters to assemble in less than 2 days a huge stage, containing nearly 150,000 b.ft. of lumber, ready for a rehearsal by a cast of 4,600 persons appearing in "The Romance of a People", in New York City. Soon after the great stage had been assembled at an athletic field for the original program of four outdoor performances, continued inclement weather made it necessary to dismantle the entire structure and re-erect it in a large armory, where altered conditions required that the stage be dropped in height to improve the visibility for the spectators. A timed schedule of operations and thorough drilling of all carpenter foremen in the processes of erection aided rapid assembling at the athletic field. Equal speed was not obtained at the armory, where untrained crews had to undertake without preparation the reassembling of the stage and the erection of bleachers to seat 4,600 spectators at one end of the long hall.

Stage Design—As originally designed by Peter Clark of New York, for the outdoor presentation, the main stage consisted of a great circular platform 150 ft. in diameter, 8½ ft. above the level of the ground, with an inner raised circular stage 75 ft. in diameter, 16½ ft. above the ground. Broad steps led from the ground to the main stage at the front, and a bridge at the rear connected the great circular platform with the reproduced facade of a temple. On both sides the circular stage was flanked by broad ramps leading down from the platform to the ground at the rear, near the bridge. A rectangular room containing apparatus for radio broadcasting was situated under the central raised stage.

A multitude of 4x6-in. posts, almost 600 in number, resting on 2x2-ft. bases supported the 17,600 sq.ft. of floor area of the circular stage. The posts were placed in rows spaced 4 ft. apart, parallel with the main axis line of the stage, with the posts in each row spaced 8 ft., c.to c. Parallel lines of 4x8-in. girders, running in the same direction as the main axis line of the stage, rested on the rows of posts, and the girders carried prefabricated 4x8-ft. box sections of flooring.

Columns and girders were fabricated at the shops of Sears Roebuck & Co., in Newark, N. J. The method of assembling these elements is indicated by the accompanying photographs. Cleats were nailed to the columns and to the girders in the shop, and the column cleats and girders were drilled to receive iron pins installed in the field. The box sections of flooring were manufactured in the Long Island City shops of the Forest Box & Lumber Co. and were placed on the girders at the site without nailing, the cleats on the sides of the girders serving to hold the floor sections in position. Posts and girders were of Douglas fir, flooring was yellow pine, splice plates were white pine, and cleats and gusset plates were ½-in. plywood.

Events immediately preceding erection at the Polo Grounds, home field of the New York National League baseball club, where the spectacle was to

BLEACHERS TO SEAT 4,600 PERSONS, constructed entirely of wood, rise on steep slope of 5.43 in. per foot from height of 10 ft. at front to 47 ft. at rear.

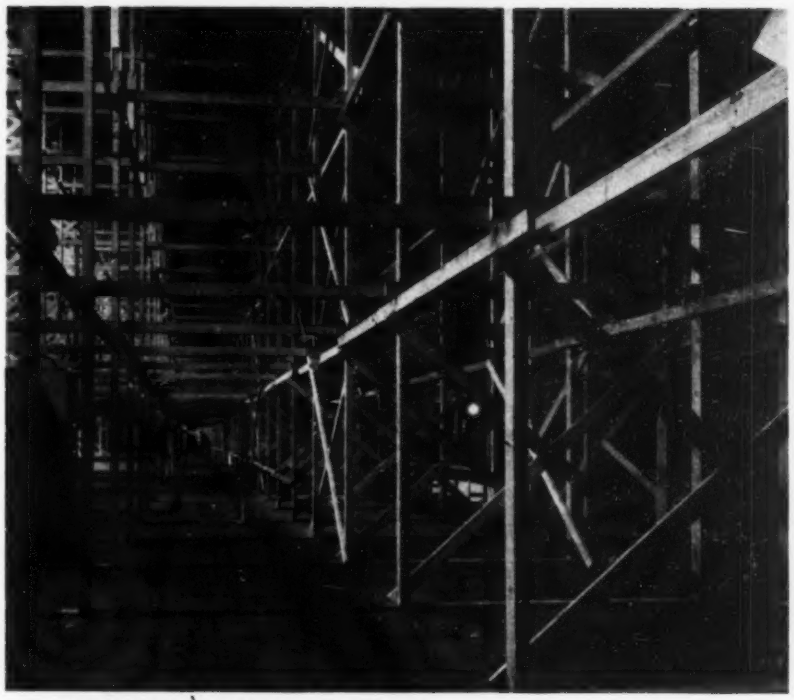
be presented, prevented the erectors from storing any of the 150,000 b.ft. of lumber required for the stage and temple at the field. The lumber was scheduled for timed delivery by trucks in the sequence in which it was to be erected, and the group of foremen who were to direct the work were thoroughly drilled in all steps of the assembling process. Late in the afternoon of the day preceding erection, several engineers of M. Shapiro & Son, who were awarded the contract for erection by Peter Clark, Inc., laid out the site for the following day's operations.

Outlines of the 150-ft. circle of the larger stage and of the 75-ft. inner circle of the raised stage were marked by 1/4-in. wood dowels driven on 2-ft. centers. Principal points of the broadcasting room, bridge, and other structural units similarly were located and marked by wood pins. The main axis line of the great circle and the center line at right angles to it were marked with rows of flags.

Erection Operations — On the following morning, a delay was caused in starting erection by failure of the first trucks to arrive on schedule. A crew of 30 laborers was on hand at 6 a.m. to unload trucks, but the carpenters, 51 in number, were not able to begin work until 10 a.m. The total force of 51 carpenters and 30 laborers worked from 10 a.m. until 7:30 p.m. On the succeeding day, a crew of three foremen, 82 carpenters, and 29 laborers carried on erection from 8 a.m. to 5 p.m. In the afternoon of this day, a rehearsal with the full cast of 4,600 dancers was held on the stage. Final operations such as the erection of the temple, bridge, and ramps, were completed on the third day by a crew of three foremen, 59 carpenters, and 16 laborers.

Moving and Re-erecting Stage — A severe storm lasting several days prevented the four scheduled outdoor performances of the pageant. As the field then had to be restored to its original condition for use by the baseball club, it was necessary to remove the stage and re-erect it elsewhere. An armory was engaged for this purpose, and the stage and temple were dismantled and re-erected to shorter height, as required by altered conditions at the new site, by day labor forces acting under the direction of members of the Peter Clark organization. To permit spectators seated on the floor of the armory to view the performance on the stage, it was necessary to lower the main stage to a height of 5 ft. 10½ in. and the raised stage to a height of 10 ft. 6½ in. Almost 600 posts supporting these two stages were cut off to the reduced length in 2 hr. 20 min. by hand sawing with a force of about 40 carpenters. Because no opportunity was offered to rehearse the foremen in the process of erection prior to assembly at the armory, the operations at this site were somewhat slower than at the Polo Grounds. Speed was not so essential here, as ample time was available before the first rehearsal of the cast.

Construction of Bleachers—To provide additional seating facilities at the armory, Peter Clark engaged the services of Samuel Valenstein, chief engineer of M. Shapiro & Son, to supervise erection of bleachers seating 4,600 persons at the end of the great hall facing the stage. The bleachers were designed with an unusually steep slope of 5.43 in. per foot, the inclined joists of the structure rising on this steep slope from a height of 10 ft. at the front to 47 ft. at the rear, next to the end wall of the building. Erection was facilitated by the fact that the inclined joists were not notched at the supports. After the joists had been nailed securely in place, white pine wedges were driven to take up the bearing. These wedges were nailed to the underside of the joists.



SUPPORTING FRAME under bleachers consists of lines of 4x6-in. posts braced in both directions and cross-braced in every third bay. Inclined timber girders of bleacher frame are tied back to wall of armory.

In plan, the bleachers measured about 280 ft. wide, sidewall to sidewall, by about 100 ft. in the direction of the slope. Lines of 4x6-in. timber posts, spaced 10 ft. apart in longitudinal direction and 10 ft. or less in the shorter direction, carried longitudinal girders on which the sloping joists rested. Each line of posts was braced with 2x6-in. lumber longitudinally, and each third bay transversely was stiffened with cross-bracing. The bleachers also were braced against the adjacent walls.

Wire-rope tiebacks from the inclined girders to the brick wall at the rear of the armory were employed to avoid any possibility of the structure's moving forward under load.

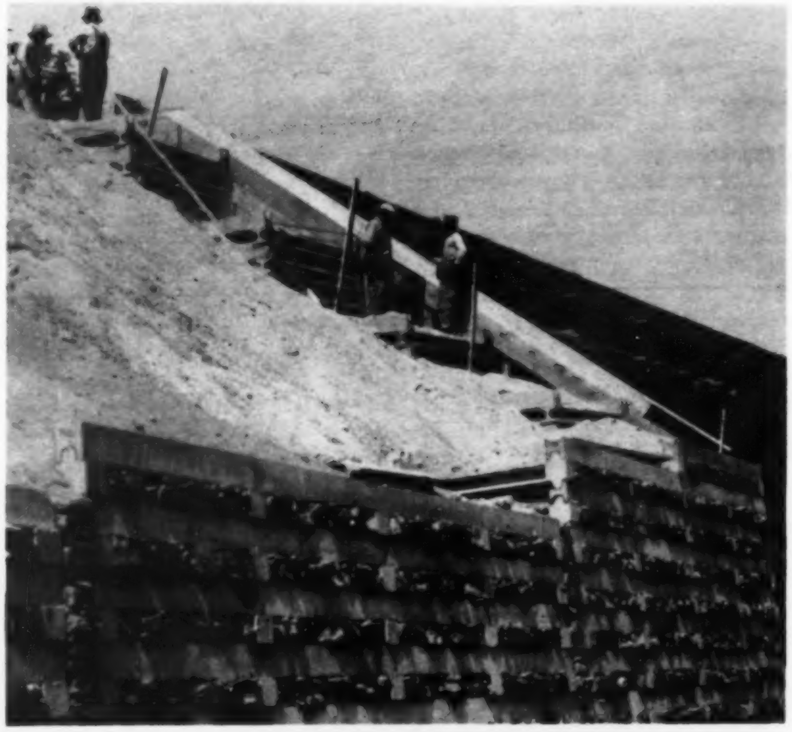
About 170,000 b.ft. of lumber was required for the bleachers. Although all the lumber was ordered cut to length from the Sears Roebuck shop in Newark, it was necessary to trim most of the pieces to exact dimensions at the site. Erection had to be undertaken without any prior drilling of the foremen in charge. Operations went forward rapidly as soon as a satisfactory organization had been molded. Less than 4 days was required to complete the erection of the bleachers.

Direction—Design and erection of structures, both at the Polo Grounds and at the armory were under the general direction of Peter Clark. Operations of M. Shapiro & Son were supervised by Samuel Valenstein, chief engineer.

SHOP FABRICATION of wood members facilitates field assembly of huge stage. Lumber, delivered in order of erection, consists of 4x6-in. posts made up on wood bases and cut to length, 4x8-in. girders drilled to receive iron pins at column connections, and 4x8-ft. box sections of flooring. In foreground, workmen are erecting broad ramp of prefabricated units.

CONCRETE CRIBS

Retain Sidehill Road



CONCRETE CRIB WALL (*right*) of open-face construction, with stone fillers between concrete stretchers, retains granulated slag fill below highway at abutment wing wall adjoining steel viaduct.

CONCRETE - CRIB retaining walls filled with granulated slag, by reducing the foundation loading as compared with walls of concrete, effected an economy in the construction on steep sidehill of an extension of the Mt. Washington Roadway, Pittsburgh, Pa. Relief labor was employed by the Department of Public Works to build the cribbing, grade the roadway, and install drainage connections. Paving of the roadway and construction of a steel bridge and a steel viaduct comprising portions of the extension were performed by contract.

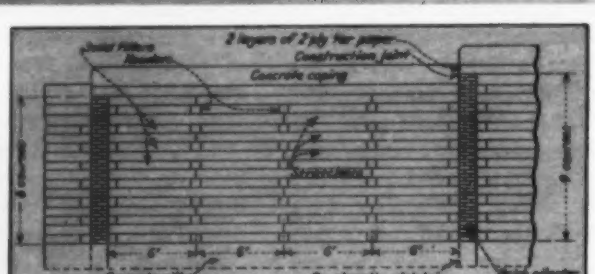
Total length of the extension, which serves as a connection affording direct access between the Liberty vehicular tunnels and the new South Tenth St. bridge across the Monongahela River, is 2,900 ft. Of this length, 1,930 ft. is in roadway and 970 ft. on viaduct. A section of roadway between the two steel viaducts is located on steep hillside requiring effective retaining structures to prevent settlement and slides, always a serious hazard on the steep slopes of Western Pennsylvania. Slag-filled cribs, by reducing the foundation pressure, help to diminish this danger.

On the upper side of the roadway, the city built 957 ft. of solid-face-crib retaining wall of the type indicated by the accompanying drawings. These cribs, ranging from three to eleven courses high, use 6-ft. or 8-ft. headers in accordance with their height. On the lower side of the roadway, two sections of open-face cribbing, 421 ft. and 72 ft. long, were constructed. The photographs illustrate the features of these cribs, which vary from six to sixteen courses high. Headers 6 and 8 ft. long were used, except at abutment wing walls, where the header length is 12 ft. Fill behind these cribs consists exclusively of compacted granulated slag.

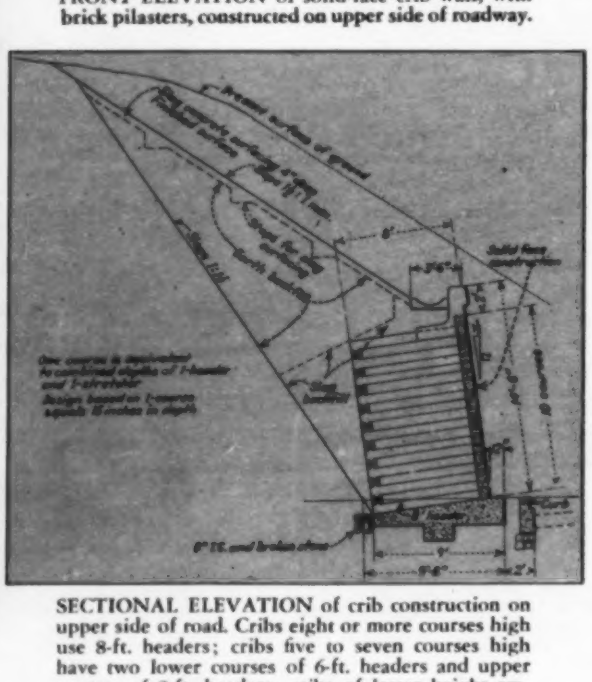
Precast concrete units for the cribs were manufactured by the R. C. Products Co., of Cleveland. Edward G. Lang is director of the Pittsburgh Department of Public Works, and Charles M. Reppert is chief engineer.

SOLID-FACE CRIB WALL on upper side of highway retains steep hillside above road. Minimum foundation loading resulting from this type of construction reduces danger of settlement.

CORNER DETAIL of concrete crib at abutment wing wall. Stretchers and headers interlock. These headers are 12 ft. long, instead of 8 ft. or 6 ft., as used at other points. Compacted slag fill behind wall is placed on stepped slope.



FRONT ELEVATION of solid-face crib wall, with brick pilasters, constructed on upper side of roadway.

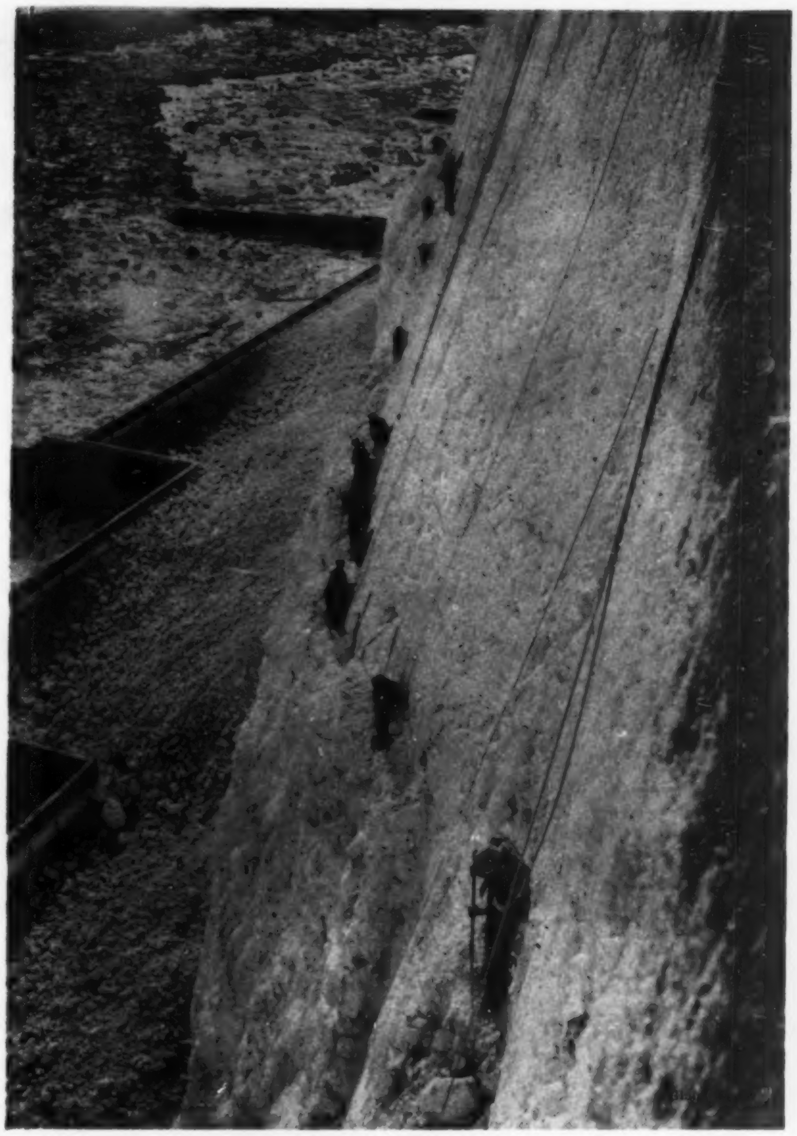


SECTIONAL ELEVATION of crib construction on upper side of road. Cribs eight or more courses high use 8-ft. headers; cribs five to seven courses high have two lower courses of 6-ft. headers and upper courses of 8-ft. headers; cribs of lesser height employ 6-ft. headers only.

JOB ODDITIES

A Monthly Page of
Unusual Features of Construction

OLD TUDOR FRONT of King John's palace at Eltham, England *(below)*, is preserved while remainder of structure is removed and will be rebuilt to serve as private residence, retaining historic character of original.



ALPINE CLIMBING SCENE is suggested by this view of men at work protecting English cliffs at Brighton with new sea wall to provide a 4-mi. along barrier against waves.

DUAL-PURPOSE ROOF. Covering protects garage across street from Richmond Hill Court apartment building and also serves as site for tennis court.

LUXURY MODEL of contractor's dump truck. Cab of 1½-ton Ford truck driven by N. Fitzgerald, hauling contractor, of Alexandria, Va., is equipped with radio, electric fan, cigar lighter, and heater.

Cement-Bound Macadam Built With

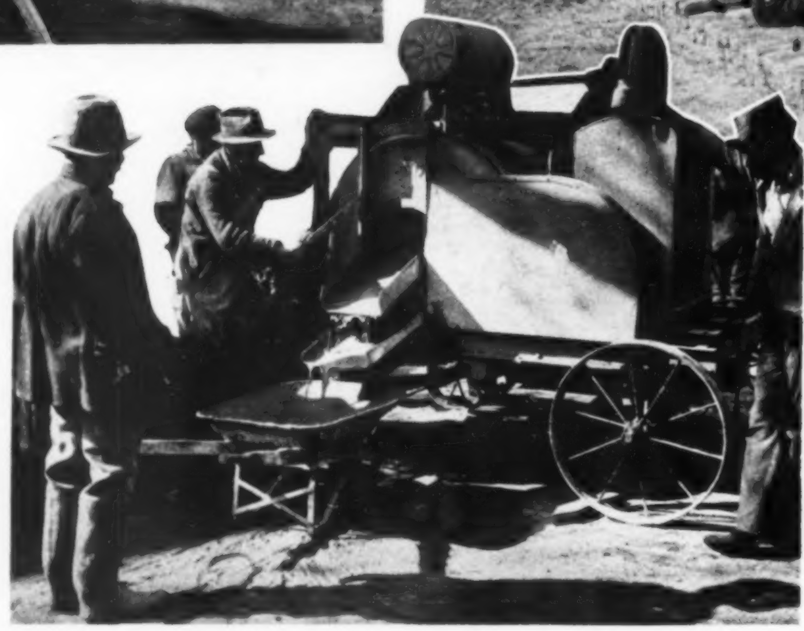
BROKEN BRICK

SUBGRADE, which has been in place 30 years is disturbed as little as possible.

SIXTY MEN *(below)* keep busy breaking brick to supply coarse aggregate for one mixer.

IN COOPERATION with the Civil Works Administration the City of Savannah, Ga., built more than 50,000 sq. yd. of cement-bound macadam pavement. The coarse aggregate used was paving brick, removed from the streets under construction and broken by hand. Some 400 men were given continuous employment from the first of the year until about April 1. Replaced pavements included in this improvement were vitrified brick laid on sand over previous shell-macadam surfaces. The pavements were about 30 years old, and traffic, combined with service cuts, had made them too rough for modern travel.

Paving Procedure—Construction operations consisted of removing and breaking the brick, preparing the subgrade, setting forms, placing and tamping the coarse aggregate, grouting, finishing and curing. The subgrade had been compacted by years of traffic and was, therefore, left as nearly as possible in its original position. Where necessary, it was compacted by hand tamping.



TWO-SACK BATCH of 1:2 cement-sand grout is mixed in 10-S mixer.

LONGITUDINAL TIMBER TAMP operated by two men consolidates coarse aggregate.

CRUSHED GRANITE *(below)* spread on broken brick provides additional thickness and wearing surface.

GROUTED SLAB *(left)* is tamped by two men using longitudinal timber equipped with plow handles. Each unit of surface receives four tampings.

WHEELBARROWS DUMP GROUT *(right)* on small platform which prevents disturbance of coarse aggregate by stream of grout and catches separated sand.

As joints in the brick had been filled with sand, the brick were easily removed and cleaned. The brick, originally $3\frac{1}{2}$x$2\frac{3}{4}$x8 in. in size, had been laid with the $3\frac{1}{2}$-in. edge vertical. They were broken with hand hammers into pieces ranging from $1\frac{1}{2}$ to 3 in. in size, averaging about $2\frac{1}{2}$ in. After being broken, the brick made a loose depth of $4\frac{1}{2}$ in. Additional required depth was obtained by casting a layer of crushed granite over the broken brick to serve as a wearing course. Because a smaller size was used, the granite made it easier to get a smooth riding surface.

GROUT CONSISTENCY is measured by length of time required for funnel full of grout to discharge.

LONG-HANDLED FLOATS *(left)* finish surface of grouted macadam slab.

A timber tamp, 6x6 in. in cross-section and 12 ft. long, equipped with plow handles at both ends, compacted and leveled the coarse aggregate. Two men operated this tamp parallel to the center line, striking the coarse aggregate with considerable force.

Grouting Methods—Grout was proportioned one sack of cement to 184 lb. of sand and about 9 gal. of water. As some of this water was absorbed by the subgrade and the brick, and as some came to the surface and ran over the side forms, the actual water-cement ratio was considerably less. The correct amount of sand was measured in a 1-cu.ft. box, $5\frac{1}{2}$ cu.ft. of damp loose sand being required for a two-sack batch. Grout was mixed in a 10-S mixer and was carried to its place in wheelbarrows which traveled on plank runways. It was wheeled as much as 100 ft. without objectionable segregation.

Proper penetration of the grout into the coarse aggregate was checked by digging a hand-hole in the coarse aggregate, down to the subgrade, and watching the grout fill the hole. If unsegregated grout came in from the bottom, when surface grout was still several inches from the hole, proper penetration was assured.

Grout consistency was tested with a standard funnel, the time required for the grout to discharge from the funnel being the measure of consistency. With the sand and coarse aggregate used at Savannah a discharge time of 23 sec. was found to give the best results. This consistency was obtained with 9 gal. of mixing water.

FINAL FINISH is imparted to slab by dragging wide strip of burlap over surface.

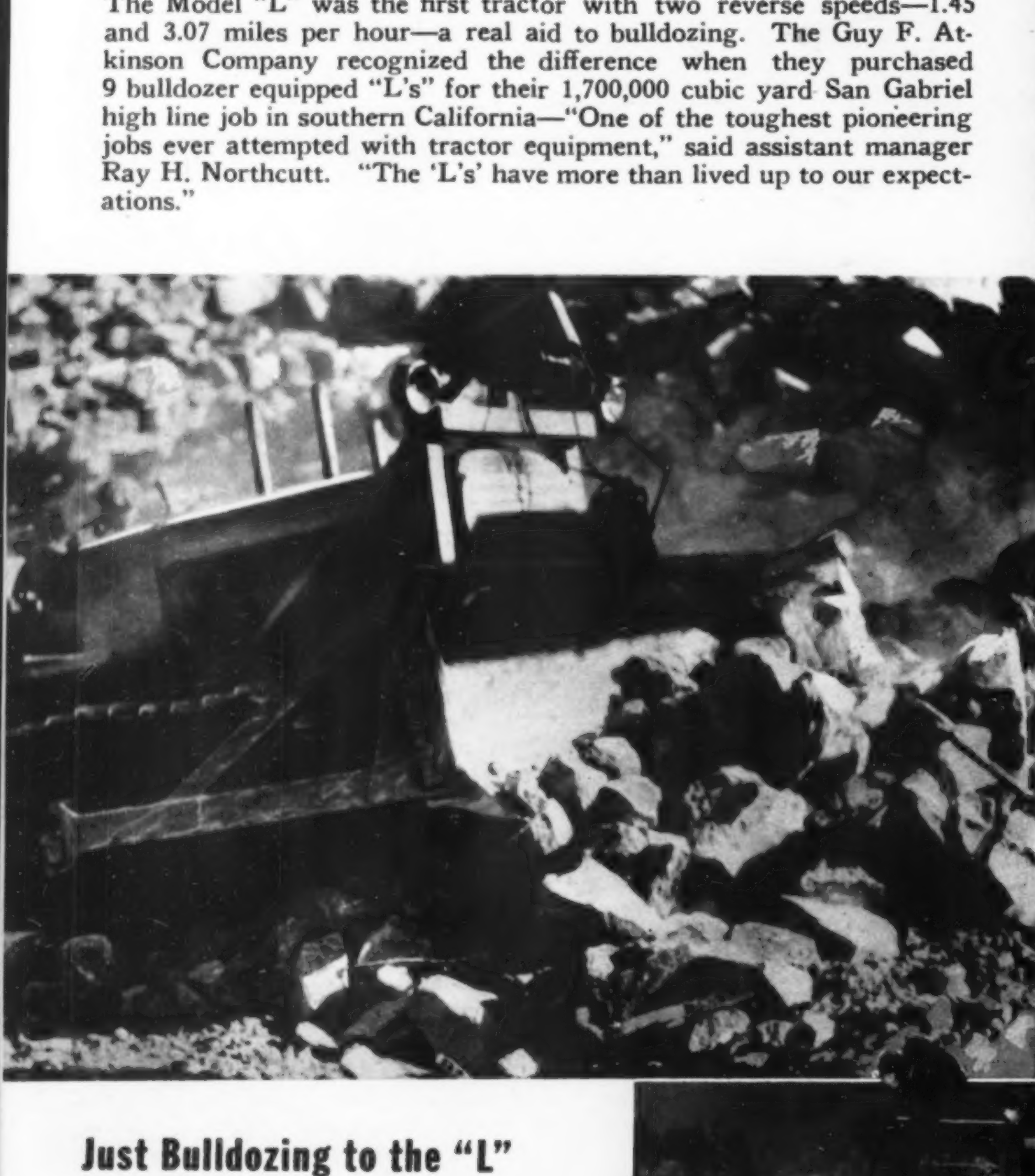
Finishing and Curing—A longitudinal hand tamp like the one already described consolidated and smoothed the grouted slab. Tamping began at one edge, proceeded to the other, and then moved back again. Successive tampings lapped one-half the length of the tamp templet. Thus each area was tamped four times after grouting. Following the tamping, the surface was checked with a straight-edge, and inequalities were corrected. The slab then was floated with long-handled floats, and a wide strip of burlap was dragged over it to give the final finish. As soon as it could be done without damage, the slab was sprinkled to prevent rapid drying and then was covered with earth kept wet for a week.

Each street was paved half at a time, making a longitudinal construction joint on the center line. Transverse joints were 1-in. boards, left in place, and were spaced at 40-ft. intervals.

Number Employed—It required from 50 to 60 men to break enough brick to keep ahead of one mixer. About 40 men were needed in handling materials and placing the slab, making a total of 100 men per mixer. Two shifts worked each day, one beginning at 7 a.m. and working until noon, the other from noon until 5 p.m. Thus, one mixer gave daily employment to 200 men, and two mixers, operating from January to April, employed 400 men. Each man worked 30 hr. per week, at 40¢ per hour, making the weekly wage $12 per individual.

TWO REVERSE SPEEDS
make a big difference in
BULLDOZING

The Model "L" was the first tractor with two reverse speeds—1.45 and 3.07 miles per hour—a real aid to bulldozing. The Guy F. Atkinson Company recognized the difference when they purchased 9 bulldozer equipped "L's" for their 1,700,000 cubic yard San Gabriel high line job in southern California—"One of the toughest pioneering jobs ever attempted with tractor equipment," said assistant manager Ray H. Northcutt. "The 'L's' have more than lived up to our expectations."



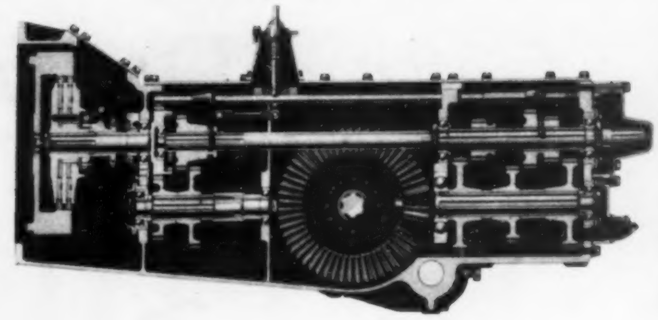
She Sure Can "Take It"

"The 'L' sure has guts," said general master mechanic C. E. Ferguson to Mr. Northcutt. "These six we have here on this Bonneville Dam job are on their third big project. Each one of those big jobs has been mighty tough excavating, too."

"The
recon
North
opera
Our
and
servic
their
highe
that
never

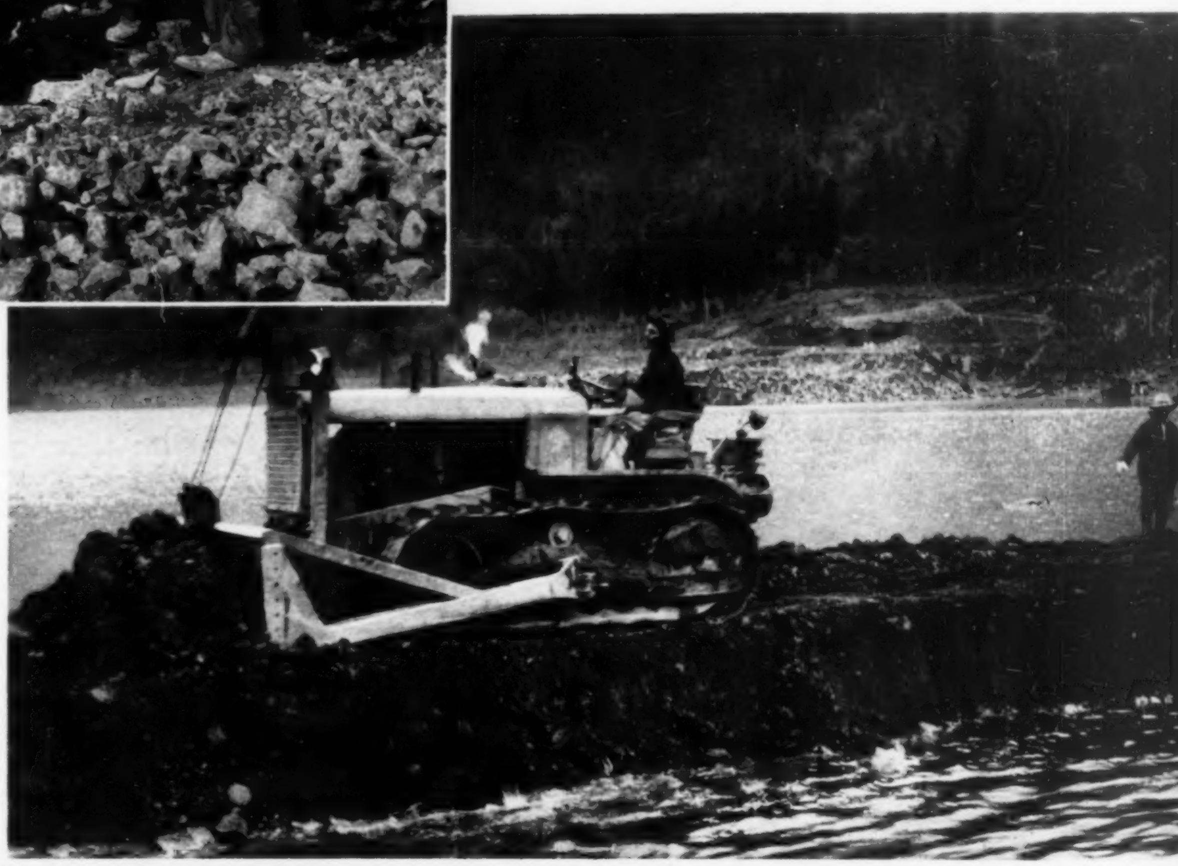
Just Bulldozing to the "L"

This may be rock to most tractors, but it's just more bulldozing for this model "L" at Bonneville Dam. "Our decision to buy A-C tractors was made only after a very thorough investigation and comparison with other leading makes," said Mr. Northcutt. "We can recommend them to any contractor with a hard job ahead of him."



Carburized Gears

Bulldozing is tough on gears, but not A-C gears. They are made of cut nickel steel, carburized and hardened to stand the toughest work. An expensive process, but the longer life proves the value of better quality. All loads are carried on extra large ball and roller bearings. The Model "L" was also the first tractor with six speeds forward, giving it a speed range from 1.94 to 6.47 miles an hour.



"A Splendid Record"

"These tractors have made a splendid record in performance," said Mr. Northcutt, "and have shown very low operating and maintenance costs. Our repairs have been at a minimum and we are well satisfied with the service of the manufacturer ... and their agents. We paid a slightly higher price for our tractors than that quoted by other makes and have never regretted our decision."

The Easter Battle

Sixteen inches of clearance and powerful traction made a whale of a difference Easter morning when the flooding Columbia River tore at the upstream cofferdam. Forty-eight hours of battle and the Model "L's" saved a big loss. They paid for themselves many times over in that short space of time. The Atkinson Company has a 898,000 cubic yard contract on the Bonneville, Oregon, navigation and power project.

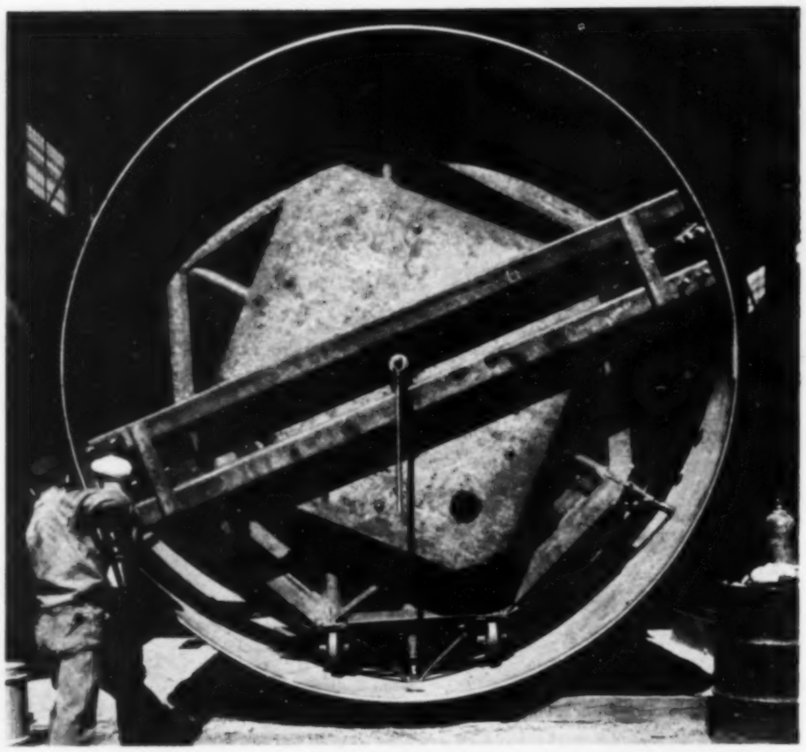
Your money is hard earned money and you want full value for every dollar you invest in machinery. Before you buy another tractor or road machine find out the "More Value" difference between A-C equipment and other makes. Then you will realize why so many contractors have standardized on A-C tractors and road machinery. There is a unit for every job—track-type and wheel-type tractors, power controlled graders, hand controlled graders, elevating graders, speed patrol graders, power units, track wagons and wagon tracks.

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

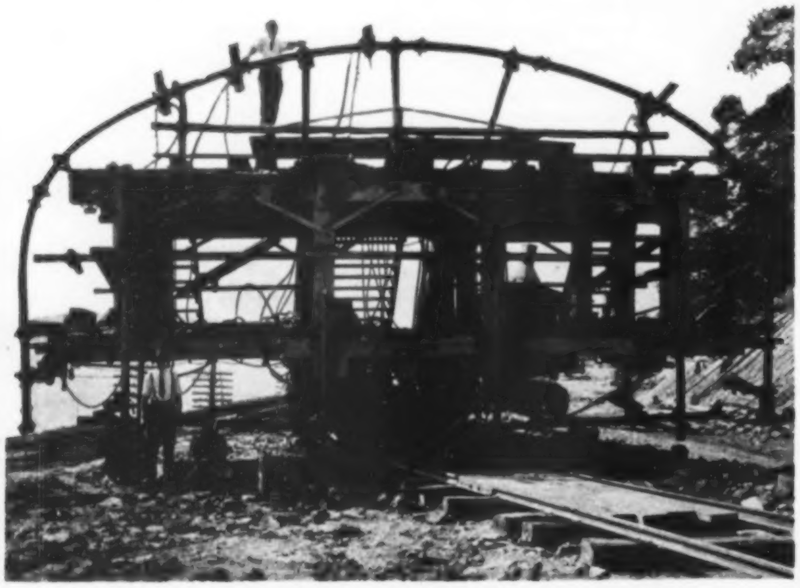
Getting Down to

DETAILS

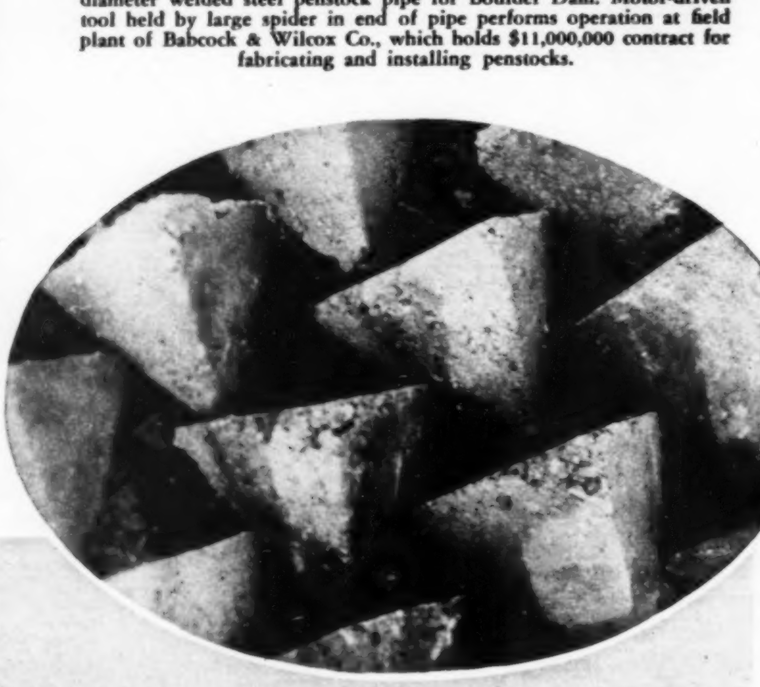
Close-up Shots of
Job Methods and Equipment



MILLING ENDS to insure final fit is last step in fabricating 13-ft. diameter welded steel penstock pipe for Boulder Dam. Motor-driven tool held by large spider in end of pipe performs operation at field plant of Babcock & Wilcox Co., which holds $11,000,000 contract for fabricating and installing penstocks.

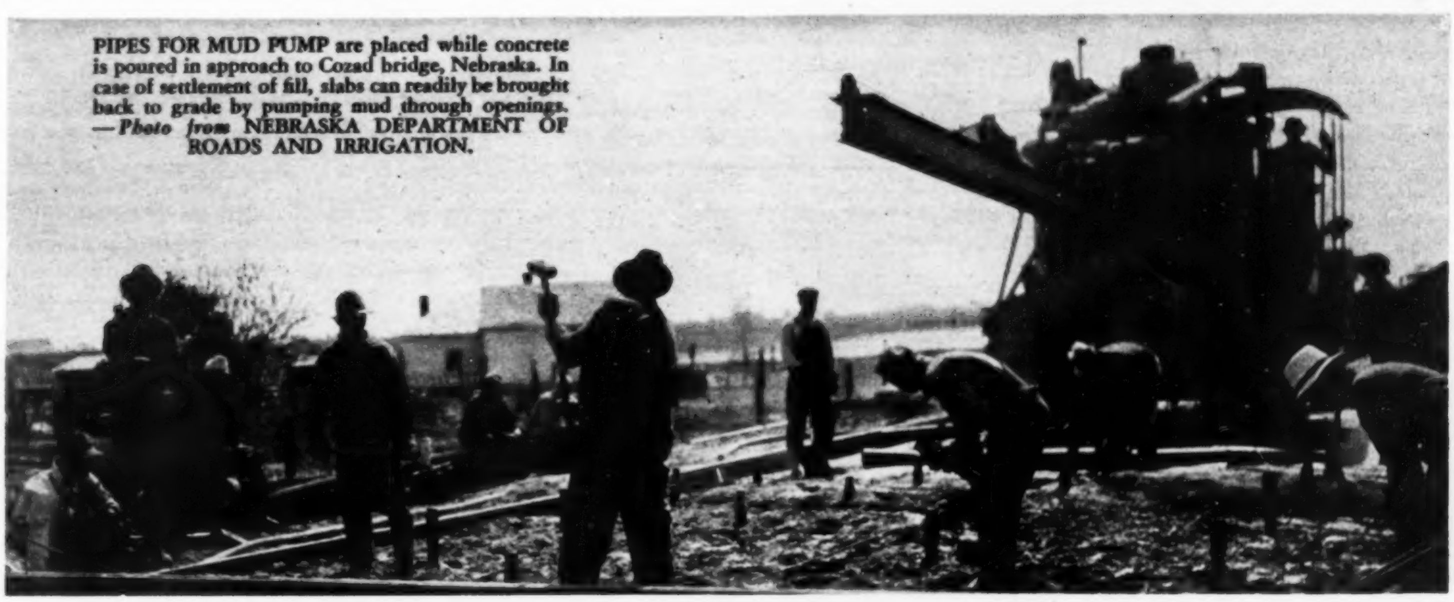


LARGE DRILL CARRIAGE mounted on railway flat car facilitates driving of 545-ft. long Breakneck Mt. highway tunnel by Walsh Construction Co. for New York State Highway Department. Carriage is equipped with 14 Ingersoll-Rand drifter drills mounted at three working levels. Tunnel providing 30-ft. roadway is 39 ft. wide, 22 ft. high with arched roof. Air is delivered to receiver and manifold on carriage by 4-in. flexible hose line.

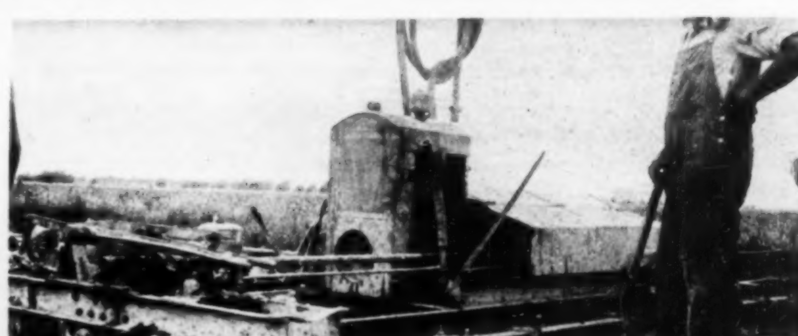


BANK REVETMENT on Mississippi River is accomplished with precast concrete blocks in form of tetrahedrons *(close-up view in insert, above)* measuring 14½ in. along each side and weighing about 30 lb. Above water line blocks are set by hand; on submerged portion of sloping bank blocks are dumped from scows. Work by day labor with PWA funds is under direction of Corps of Engineers, U. S. Army. Casting of block was illustrated *in Construction Methods* for March, p. 50.

PAVING MIXER CONCRETES SEA-WALL. Standard 27-E Smith unit, equipped with 33-ft. inclined boom, builds 9,000 lin.ft. of 8 ft. 6 in. high concrete barrier at Fortress Monroe, Va. Bucket is raised by power to point high enough to discharge directly into forms, returning, empty, by gravity. Boom is stiffened with special trusses and rigged with tripod support. Special hangers keep bucket in horizontal position.



PIPES FOR MUD PUMP are placed while concrete is poured in approach to Cozad bridge, Nebraska. In case of settlement of fill, slabs can readily be brought back to grade by pumping mud through openings. —*Photo from* NEBRASKA DEPARTMENT OF ROADS AND IRRIGATION.



TWO-WAY CHUTE *(left)* below box rigged on paving mixer of Alva F. Adams, contractor, distributes concrete direct to 4-ft. widening strips on each side of old 10-ft. concrete pavement in Iroquois County, Illinois. **SPECIAL SCREED** *(right)* on 18-ft. finishing machine strikes off and finishes both 4-ft. strips. — *Photo from* ERNST LIEBERMAN, *chief highway engineer of Illinois.*

Last of a Series of Four Articles:

PUTTING SYSTEM TO WORK IN FIELD AND OFFICE

4 . . .

Handling Plans at the Field Office

By GEORGE E. DEATHERAGE

Superintendent of Construction, South Charleston, W. Va.

IT IS SURPRISING that so many contractors, both large and small, have no standardized practice in force for receiving, issuing and recording drawings at the field office. Like a great many items of field office routine, this matter is not given the consideration it merits. A thorough analysis, however, points to the fact that systematic procedure results in considerable clerical economy, less confusion, and the reduction of errors from void prints in active circulation.

● Every experienced construction executive has, at some time or other, been confronted with losses on the job due to void prints not being removed promptly from the hands of foremen. Any system of issuing, receiving and recording drawings must, therefore, take into consideration the matter of removing such drawings from circulation at the proper time.

● In this article the writer will describe a system used successfully by him on numerous large projects. Having been in active operation a number of years, the "bugs" have been reduced to a minimum, and it is offered as a practical solution to this problem. It covers completely the following major phases incidental to the primary issuance of the drawings from the central office, until they find their way into the hands of the ultimate user.

(1) Issuing plans from the central office.
(2) Plans issued to subcontractors.
(3) Receiving and recording plans from central office.
(4) Receiving and recording shop drawings from manufacturers, subcontractors and others.
(5) Recording plans made on the job.
(6) Issuing plans from the field office to foremen and other departments.
(7) Issuing plans to material men, subcontractors, etc.
(8) Return of void plans.

● (1) *Issuing Plans from the Central Office*—Plans issued to the field office are either issued as "Preliminary", "For Sub-bids", "For Construction", or for some other special purpose. They are issued as original issues, revised issues, or are cancelled and superseded by other drawings.

DRAWING RECORD CLERK and files in field office.

Naturally the issuance of drawings by the central office requires some accompanying information which cannot be noted on the drawing itself. Some firms accompany the drawings with a letter stating the purpose for which the drawings were sent and such other special data in relation to revisions, etc., as may be necessary. Although letters may cover the situation completely, as far as sending information is concerned, they do not lend themselves to systematic recording at the field office and they require their dictation at the central office by someone with all the details at hand.

A far better means is to substitute for the usual letter, a printed "Bulletin" which, as shown in the illustration, carries all the essential information. Copies of this bulletin are sent to all interested parties, with or without the accompanying drawings. Each bulletin is numbered so that each issue may be properly recorded. They state the number of prints issued, whether preliminary, for construction, purchasing, approval, etc. The bulletin should briefly describe all revisions, the date of issue, drawing or specification numbers and, in fact, any information which is needed to make intelligent use of the drawings by those receiving them. It should also state whether the drawings are those of original issue, or are revised, calling particular attention to the details of all revisions and asking for the destruction or voiding of all previous prints by that drawing number.

If the central office issues plans to subcontractors, material men, manufacturers, etc., the job superintendent and purchasing agent should always be sent a copy of the bulletin, even if no plans are issued to them. The distribution of all prints and copies of the bulletin should be clearly stated at the bottom of each bulletin.

This system of handling plans at the main office, or central office of distribution, reduces the procedure to an established routine that can be handled by the regular clerical and engineering forces. All the preparatory work is performed automatically by the staff and only requires checking and signature of the executive under whose name the drawings are mailed out. The office copy of the bulletin is filed in the bulletin register, in numerical order, so that a moment's reference can locate each numbered sheet. Each copy of the accompanying drawings is stamped with the "Issued Date" and "Bulletin Number" on the back, the bulletin is attached, and the parcel is ready for mailing.

● (2) *Plans Issued to Subcontractors*—The same procedure is used to send drawings to manufacturers, subcontractors, etc., either with or without a letter of further explanation of details shown.

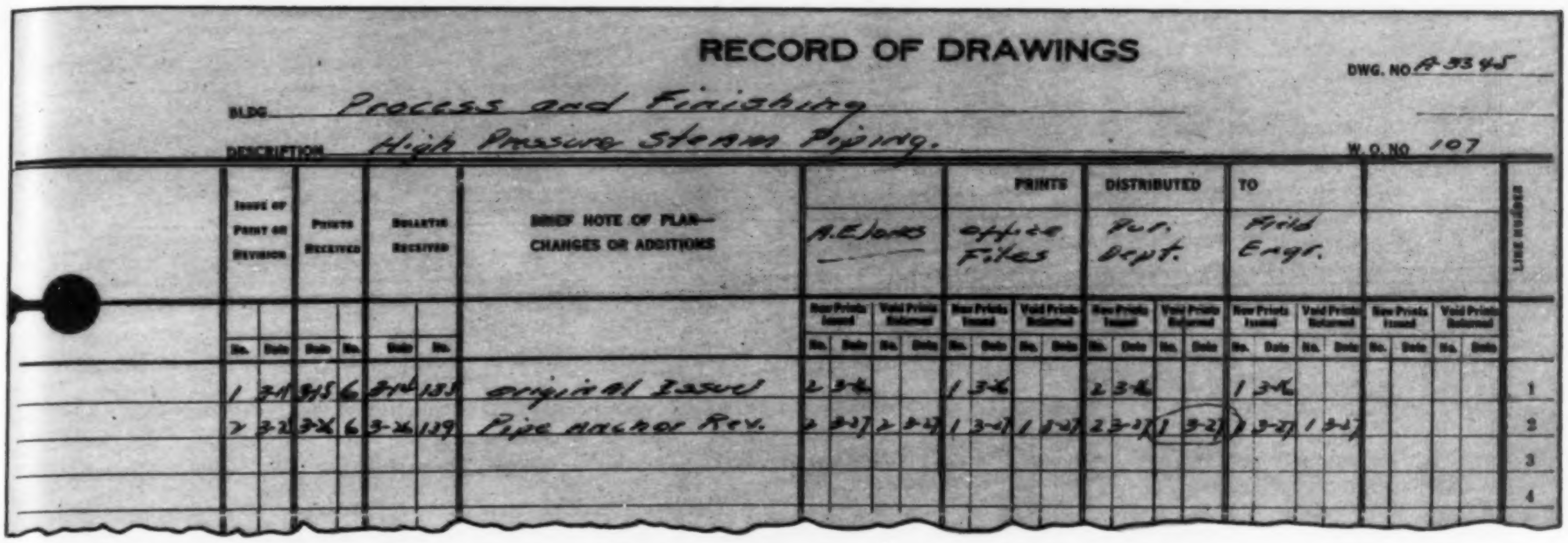
The job superintendent and purchasing agent must always receive a copy of the bulletin.

● (3) *Receiving Plans at the Field Office*—Each drawing, as it is removed from the mail, is stamped on the back with the date received. As has been explained, it has already been stamped at the central office with the date of issuance and the bulletin number. All such plans, bills of material and specifications received are then recorded in the drawing ledger, which is a printed form bound in a loose-leaf ledger. A sheet from such a ledger is shown.

A separate sheet is maintained for each drawing number, whether it is from the central office, from a subcontractor, manufacturer, or from any other source. By the means of index tabs the post binder is divided into numerous sections, either by classifications, such as "Foundations to grade", "Piping", "Equipment", etc., or by a number sequence. This makes for ease in locating each sheet when desired.

The number of prints received, date of revision, etc., must be recorded below the last entry in the spaces provided at the left-hand side of the sheet. Prints are then issued and recorded, the name of the person receiving them and the number of drawings issued to them being noted in the space provided. As will be seen, the one sheet in the ledger provides a permanent record of those that have drawings, the number of same, date given them, etc., as well as the void prints taken out of service.

● (4) *Issuing Plans from the Field Office*—After plans received are properly recorded in the ledger, they are issued to foremen, subcontractors, manufacturers, etc., on what are known as Field Bulletins, an illustration of which is shown. These bulletins, like the bulletin of original issue already described, carry all the pertinent data by which the individual receiving them can use them intelligently. In addition, such other information as the field office may wish to transmit to the foreman, subcontractor, etc., in regard to the work on the drawings covered by the bulletin, is noted thereon. The bottom of these field bulletins carries a perforated receipt form which the party receiving the drawings returns to the field office, together with all copies of


RECORD OF DRAWINGS

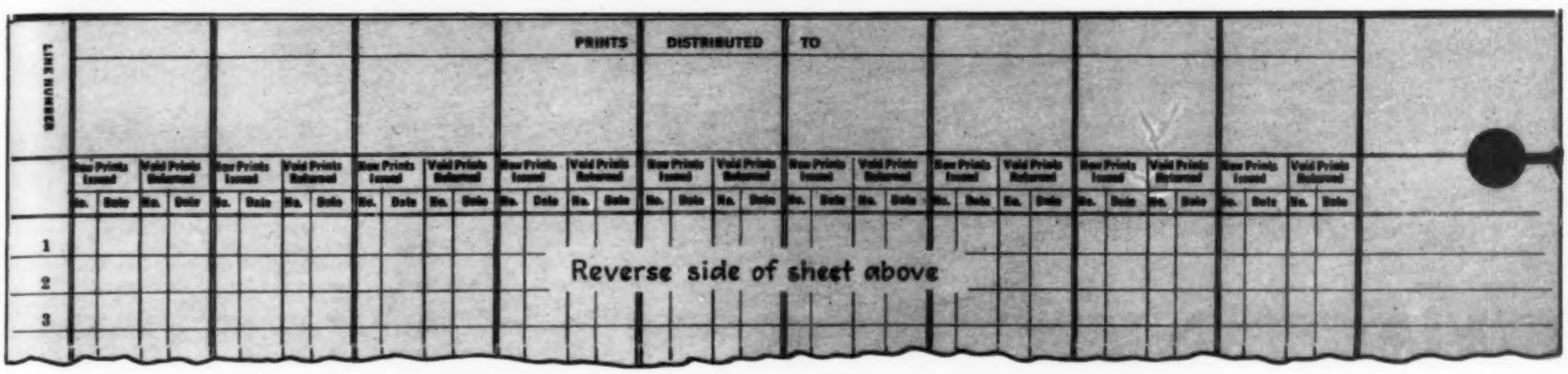
DWG. NO. A-3345

BLDG. Process and Finishing

DESCRIPTION High Pressure Steam Piping.

W.O. NO 107

Issue of Print or Revision (No.)	(Date)	Prints Received (Date)	(No.)	Bulletin Received (Date)	(No.)	Brief Note of Plan—Changes or Additions	A.E.Jones	Office Files	Pur. Dept.	Field Engr.	Line Number
1	3-1	3-15	6	3-16	135	original Issue	2 3-16	1 3-16	2 3-16	1 3-16	1
2	3-22	3-26	6	3-26	139	Pipe anchor Rev.	2 3-27 2 3-27	1 3-27 1 3-27	2 3-27 1 3-27	1 3-27 1 3-27	2
											3
											4


LINE NUMBER

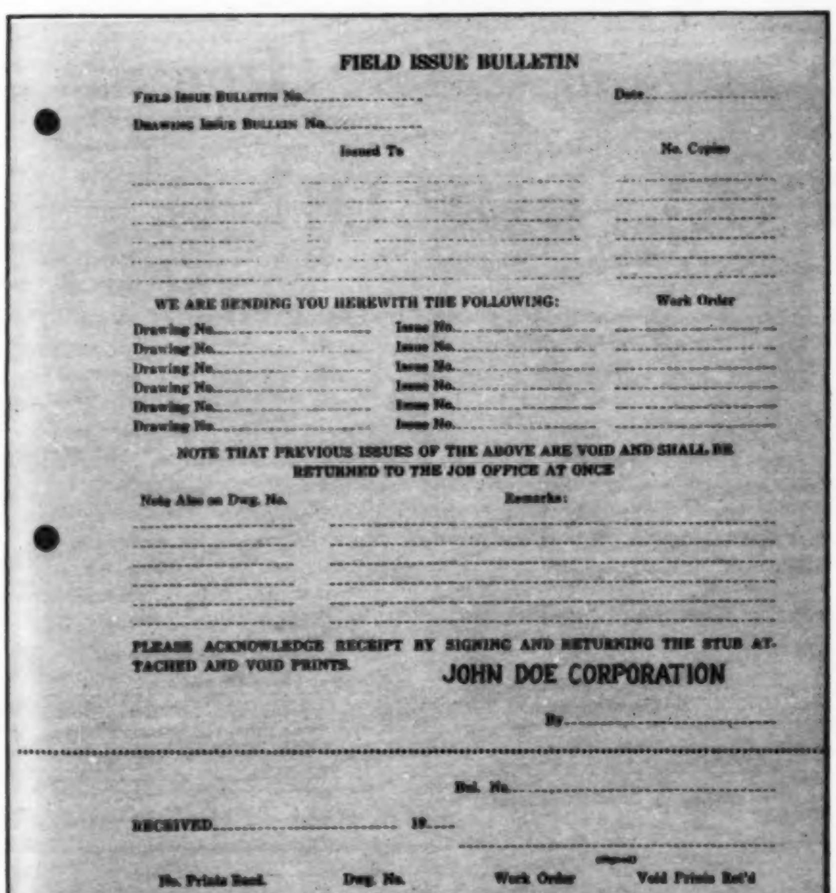
PRINTS DISTRIBUTED TO

New Prints Issued — Void Prints Returned — No. Date

1

2 Reverse side of sheet above

3


FIELD ISSUE BULLETIN

Field Issue Bulletin No.................. Date..................

Drawing Issue Bulletin No..................

Issued To No. Copies

WE ARE SENDING YOU HEREWITH THE FOLLOWING: Work Order

Drawing No.................. Issue No..................

Drawing No.................. Issue No..................

Drawing No.................. Issue No..................

Drawing No.................. Issue No..................

Drawing No.................. Issue No..................

Drawing No.................. Issue No..................

NOTE THAT PREVIOUS ISSUES OF THE ABOVE ARE VOID AND SHALL BE RETURNED TO THE JOB OFFICE AT ONCE

Note Also on Dwg. No. Remarks:

PLEASE ACKNOWLEDGE RECEIPT BY SIGNING AND RETURNING THE STUB ATTACHED AND VOID PRINTS.

JOHN DOE CORPORATION

By..................

Bul. No..................

RECEIVED.................. 19....

(Signed)

No. Prints Recd. Dwg. No. Work Order Void Prints Ret'd

Form No............

DRAWING ISSUE BULLETIN NO......................

W. O. .... Date..........................

BOILER HOUSE

Ten (10) prints each of our drawings for Purchase and Construction.

No. 21—Boiler House Structural Framing		Issue No. 2	1/19/30
No. 37— " "	Piping	Issue No. 3	1/20/30
B.M. 67— " "	Piping	Issue No. 1	1/20/30

Drawing No. 21.

Elimination of diagonal bracing between bents 3 and 4 on the North elevation. Portal bracing substituted. Platform added on West elevation.

Drawing 37.

Change in location of exhaust steam line from Condenser No. 1. This was moved to provide necessary clearance due to change in size of condenser as shown on Allis-Chalmers drawing No. 600001, dated 1/17/30. This issue releases the "HOLD" which was placed on this work under Bulletin No. 90, dated 1/10/30.

B/M #67.

Additional material due to above change on Drawing No. 37. Note particularly the items marked JOB PURCHASE under "Remarks" column.

Please destroy or Void all previous issues of drawings No. 21 and No. 37.

Copies to:
Field Supt.
Purchasing Dept.
Accounting Dept.
Office Files.

Prints distributed as follows:
5 prints to T. Jones
1 print to O. Nelson
1 print to J. W. Harper
1 print to Allis-Chalmers.

Signed..

Asst. Eng. of Construction.

any prints voided. This is a difficult rule to enforce but must be insisted upon to prevent void prints being used in the field. The work spoiled by one day's use of a void print will quickly offset the trouble it takes.

● (5) *Return of Void Prints*—Those having void prints in the field, as shown by the ledger, are credited when the void prints are returned. If anyone receiving revised prints does not return the voided drawings the file clerk should report it at once and special effort should be made to obtain them. If the ledger has been properly kept, there will be no excuse for anyone in the field having a void drawing.

● *Summary*—The reader will have noted that a system such as the one described relegates the handling of job documents such as drawings, specifications, bills of material, etc., to mere routine. Although we have talked about the recording of drawings only, bills of material and specifications are similarly handled. These latter records require only a separate division in the ledger, or in sufficient volume, a ledger of their own.

It enables job records to be kept accurately and speedily, as well as forming a complete summary of job activities in case of argument or litigation.

INLAND TERMINAL NO. 1 of Port of New York Authority, sixteen stories high, consists of steel skeleton-frame unit at each end with middle section of steel-cored concrete columns to tenth floor (where setback may be seen) and reinforced-concrete construction above this level. Great size of building, covering $3\frac{3}{4}$ acres, emphasizes importance of material-handling and distribution methods.

MECHANICAL HANDLING METHODS

Produce Construction Economies on Huge

INLAND TERMINAL BUILDING

EQUIPPED to an unusual degree with mechanical means of handling and distributing materials, the plant which the Turner Construction Co. installed to build Inland Terminal No. 1 for the Port of New York Authority demonstrated the economies obtainable through bold and intelligent planning of a large building job. Screw conveyors and automatic weighing batchers for bulk cement, belt conveyors to distribute concrete, and skid platforms and lift trucks to deliver brick and mortar to the bricklayers were some of the more important features of the plant.

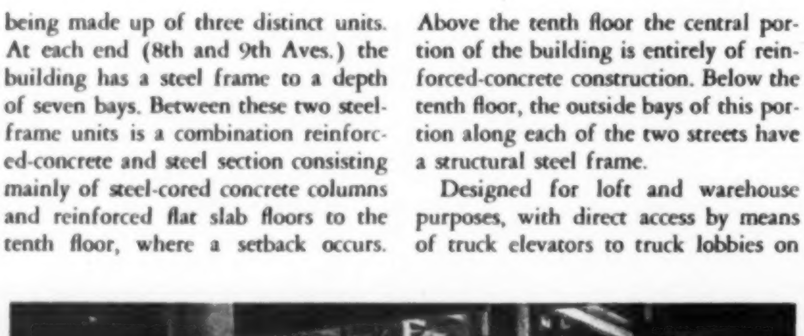
Size of Job — Covering an area of about $3\frac{3}{4}$ acres and rising to a height of 16 stories, the size of the structure placed a premium upon economy in distributing materials. The building occupies the entire block bounded by 8th and 9th Aves., 15th and 16th Sts., New York City, with a length of 800 ft. between the avenues and a width of 206 ft. between the streets.

Structurally, the building is unusual, being made up of three distinct units. At each end (8th and 9th Aves.) the building has a steel frame to a depth of seven bays. Between these two steel-frame units is a combination reinforced-concrete and steel section consisting mainly of steel-cored concrete columns and reinforced flat slab floors to the tenth floor, where a setback occurs. Above the tenth floor the central portion of the building is entirely of reinforced-concrete construction. Below the tenth floor, the outside bays of this portion along each of the two streets have a structural steel frame.

Designed for loft and warehouse purposes, with direct access by means of truck elevators to truck lobbies on each floor, the structure necessarily is of heavy consruction. The first floor and the basement both are traversed for their full length by truck driveways separated by long platforms for the transfer and handling of less-than-carload freight.

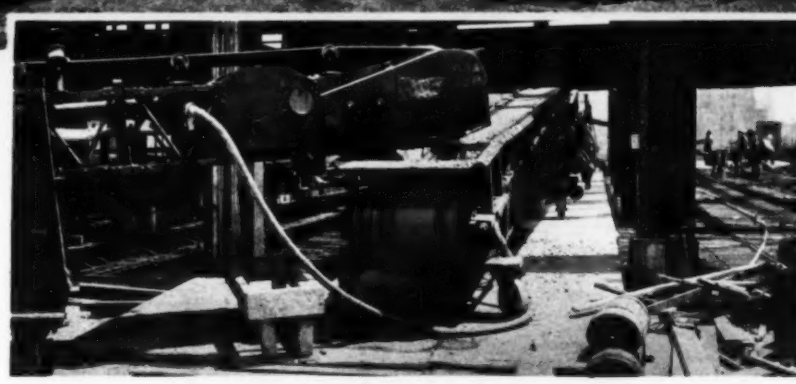
In cubical content, the Inland Terminal (known also as the Port Authority Commerce Building) is second to the Merchandise Mart, in Chicago, the largest building in the world, with inclosed space aggregating 37,224,000 cu.ft., as compared with 53,000,000 cu.ft. in the Merchandise Mart and 37,000,000 cu.ft. in the RCA building, Rockefeller Center, New York City. The floor area of the Inland Terminal, 2,400,000 sq.ft., is much less than that of the Merchandise Mart, with 4,000,000 sq.ft., but exceeds the RCA building by 300,000 sq.ft.

Steel Erection — A method which has rarely been applied to building construction was utilized by the Taylor-Fichter Steel Construction Co., of New York City, subcontractor for the steel



TRAIN OF PORTABLE BELT CONVEYORS, resting on runway raised above steel reinforcement, delivers concrete from dual tower hoists to point of placement.

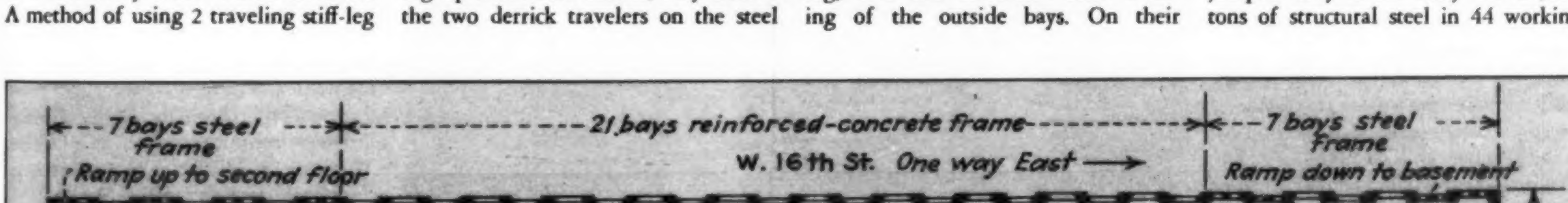
ALUMINUM CHUTES *(above),* **handled with minimum of labor, distribute concrete from elevated discharge end of conveyor train.**



ELECTRIC-MOTOR DRIVE propels belts of conveyors, which are connected in series from single power line.

erection, in erecting about 26 bays in the central portion of the structure, including the steel cores for the steel-and-concrete columns, to the tenth floor level. As the general contractor planned to pour each floor complete from end to end, it was necessary that steel be erected over the entire area simultaneously. To perform this work with guy derricks would have required a total of 14 rigs. Study of the reinforced-concrete unit of the building convinced the steel erector that this portion could be erected successfully with derrick travelers. A method of using 2 traveling stiff-leg derricks accordingly was worked out, reducing the total number of guy derricks required to six.

After guy derricks at the east end of the building had carried the steel framing up about four stories, they erected the two derrick travelers on the steel frame at the second floor level. In their first pass to the west these travelers placed ahead of them, forming in this way their own working platform, the steel column cores, with necessary bracing, and the structural steel framing of the outside bays. On their return pass to the east, they placed steel between the second and sixth floors, all steel being erected in two-story lengths. At the end of this pass, a special guy derrick on the structural steel unit at the east end dismantled the travelers and then lifted and reassembled them at the sixth floor level. Moving to the west on this level, the travelers erected steel to the tenth floor. It will be noted that in erecting steel to the tenth floor, the two traveling derricks made three passes and were jumped only once. They set 12,000 tons of structural steel in 44 working



GROUND FLOOR PLAN of Inland Terminal No. 1 indicates location of construction plant: (1) Trolley hoist for reinforcing steel, in future truck-elevator shaft; (2) steel bin for bulk cement, in another truck-elevator shaft; (3) hatchways for dumping sand and gravel into bins under floor; (4) hoist towers for concrete buckets; (5) hatchway to 500-bbl. self-cleaning cement storage bin; (6) mortar and brick hoist from sub-basement, in future smokestack shaft; (7) brick hoist, rising from second floor; (8) sand storage bin for mortar plant in basement; (9) bulk-cement storage bin for mortar plant; (10) chute for lime putty; (11) telephone from mixing plant to top of building, equipped with horn signal to call men to telephone; (12) steel benders, in ground floor driveway. Plants at two ends of building are duplicates.

days. A total of 24,000 tons of structural steel was required for the entire building.

Material Quantities—An appreciable outlay for material-handling equipment was justified by the large quantities of materials needed for the Inland Terminal. Concrete in the superstructure totalled 98,000 yd. and required 150,000 bbl. of cement, 76,000 yd. of gravel, and 68,000 yd. of sand. Wall backing called for 9,000,000 sand-lime brick, which were light in color and slightly larger and heavier than common brick. This brick backing forms the inner finished surface of the walls and provides a light-colored surface which aids illumination.

GASOLINE-ELECTRIC LIFT TRUCK moves pan of mortar on skid platform. Nine lift trucks and 350 skid platforms handle 12,000,000 brick and 11,000 cu.yd. of mortar.

SKID PLATFORMS *(above)* transported by lift trucks deliver loads of brick to convenient position for handling by bricklayers' helpers.

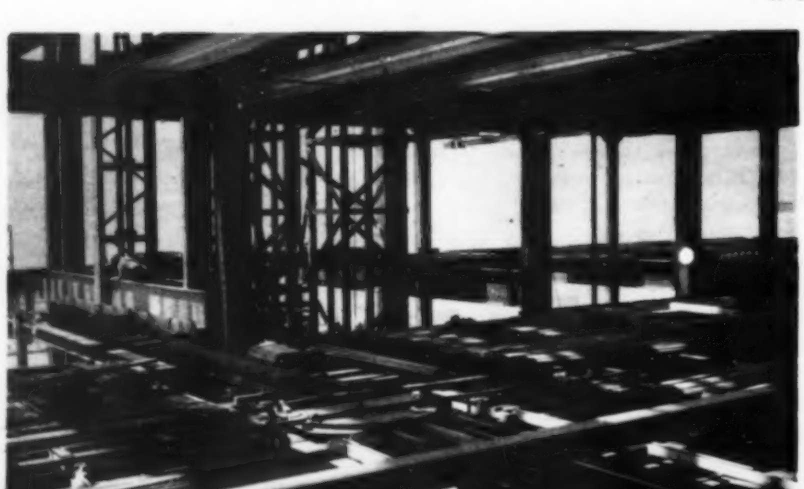
LOADED SKID PLATFORM, with sideboards removed, is picked up by lift truck. Light-colored sand-lime brick are used for wall backing, which is exposed on inside of building.

Exterior facing of the walls consists of limestone to the third floor level and of hard-burned smooth red brick above this level. About 3,000,000 red brick were required for the wall facing. Hollow clay tile was specified for 280,000 sq.ft. of partitions. About 11,000 yd. of mortar was used in connection with the brickwork on the job.

For the great area of formwork, including the 2,500,000 sq.ft. of floors, the contractor purchased 2,200,000 b.-ft. of lumber and 415,000 sq.ft. of Masonite Presdwood to be used as form lining. The concrete forms and lining were used repeatedly.

Plant Layout—As indicated by the accompanying plan, the building was adapted to efficient layout of construction plant. The contractor utilized permanent truck entrances and ramps to deliver material to the job. Four pairs of permanent truck entrances gave convenient access to the two end sections of the building from 15th and 16th Sts. All of these entrances provide access to the first floor. Four of them, in addition, open on to ramps connecting with the basement, and two serve ramps rising to the second floor.

Permanent shafts in the building provided convenient locations for concrete mixing plants and material hoists. Four large truck-elevator shafts, situated in pairs at about the quarter points of the building, furnished desirable space for two concrete mixing plants, with their hoist towers, and for hoists to handle reinforcing steel.



TRACK LAYOUT, turntable and narrow-gage carriage employed to transport reinforcing steel from cantilever platform in elevator shaft to storage space in truck lobby of upper floor.

Mixers at the concrete plants and at a mortar plant near the center of the building were placed in the basement to permit gravity delivery of materials from trucks which dumped on the first floor. The mortar hoist was installed in a convenient shaft which now houses the smokestack of the building.

As soon as construction had progressed beyond the second floor, a long driveway was kept open along the 15th St. side of this floor to provide for truck delivery of brick and tile. These materials were transferred by hand directly from the trucks to skid platforms on the floor.

Bulk Cement—Because of the large volume of cement (155,000 bbl.) required for the work, it was a matter of decided economy to the contractor to install equipment to handle this material in bulk. Between 120,000 and 130,000 bbl. of the total cement requirement was purchased in bulk and was shipped in moisture-proof steel cars of 260-bbl. capacity from the mill at Nazareth, Pa., to an unloading plant at the foot of West 28th St., New York City. At this plant the cars discharged their loads of cement through dustproof spouts into a hopper under the tracks. A screw conveyor elevated the cement from this hopper into a steel storage bin which held about 500 bbl.

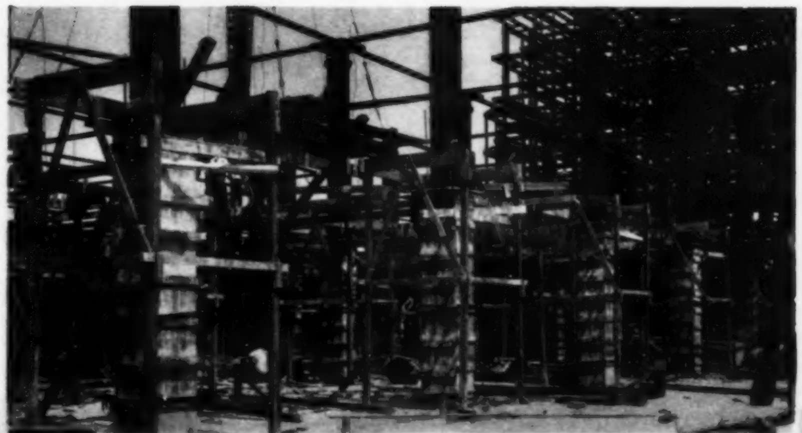
From the plant the bulk cement was transported to the job by trucks with specially designed steel bodies of 55 bbl. capacity. The truck bodies were trough-shaped and were tightly inclosed to make them dustproof and moistureproof. Cement was loaded from the plant storage bin by means of a canvas spout through hatches in the top of the steel bodies. To prevent loss of cement during this loading operation each truck body was equipped with a vent which was connected by a canvas tube and pipe to the bin. Air in the truck body displaced by the inflowing cement passed through this vent to the top of the bin.

To discharge cement at the job each truck was equipped with a longitudinal screw, in the bottom of the trough-shaped body, which was driven by a power take-off from the truck transmission. The cement discharged from the truck body through a pipe at the rear to which a canvas spout was attached. This spout discharged the cement through a circular opening in the concrete floor into a bin directly beneath. About 5 min. was required to load a truck with cement, and from 5 to 10 min. was consumed in discharging the load at the job. The distance from the loading plant to the building was about $1\frac{1}{2}$ mi.

Bulk cement was handled in exactly the same way at both concrete mixing plants. The motor trucks at each plant discharged cement through an opening in the first floor into a 500-bbl. steel bin. To move the cement from this bin to a 280-bbl. steel bin at a higher level, from which the cement could flow by gravity to the weighing batcher and thence to the mixer, each plant was equipped with a Sprout-Waldron conveyor having a horizontal and a vertical screw, electrically driven, and capable of delivering 110 to 120 bbl. per hour

to the elevated bin. The horizontal screw, 8 in. in diameter and 40 ft. long, conveyed the cement to a 9⅜-in. vertical screw 40 ft. high which elevated the cement to the upper bin.

Several factors contributed to the saving made possible by the use of bulk cement. The principal items were: A price differential in favor of bulk cement; lower cost of transporting bulk material from the railroad terminal and storing it at the building site; and elimination of the expense of cleaning



STEEL REINFORCEMENT of flat-slab floor in middle section of building. Belt-conveyor runway will be supported on wood horses to prevent dislocation and bending of bars.

FORMS AND SHORES *(above)* are made up in standard-size units for repeated use and are designed for ease of erection and dismantling. Middle section of building has steel-cored concrete columns to tenth floor.

FLOOR AND COLUMN FORMS are lined with composition board to give smooth finish to concrete. Floor lining is stripped and laid anew each time forms are moved.

cloth bags and returning them to the manufacturer. A close check revealed that practically no cement was lost in transit between the mill and the mixing plant.

Automatic Weighing Batchers — One Fuller automatic weighing batcher metered cement for two Ransome 1-yd. mixers at each of the concrete mixing plants. The batcher was equipped with a double beam scale, one of the beams being used to balance the tare weight of the apparatus and the other to weigh the cement. A roll feeder driven by a built-in motor and speed reducer filled the batch hopper. The feeder motor circuit was compensated to allow for cement in suspension when the roll stopped. A magnetically operated brake cut off the feed when the weigh beam came to balance. Cement was discharged from the batch hopper by a motor-driven rotary valve designed to permit the operator to control the rate of discharge.

Operation of the apparatus was controlled by push buttons, but the equipment was designed with an electric interlock which prevented improper manipulation. Once the starting button had been pushed, the interlock controlled all operations until the weigh beam came to balance, when the discharge circuit was completed to permit the operator to discharge the batch by closing the proper push button. The operator could not discharge the hopper if the weight of cement was not within the tolerance permitted, nor could he close the discharge gate or start the feeder motor until the hopper was completely empty.

CLEANING UP on upper floor of building. Light motor truck collects rubbish for disposal.

Cement passed from the weighing batcher by means of a two-way chute to the gravel hopper of either of the two mixers and flowed with the gravel into the drum, thus reducing to a minimum the loss of dust. As an unusual feature of the cement gaging set-up, the poise on the weigh beam was set permanently at 470 lb. The operator changed the proportions of sand and gravel to produce the various mixes: 1:2:4, 1:1½:3, and 1:1:2, measuring out two batches of cement for the richest mix.

Distributing Concrete — Two wood hoist towers to serve the mixers of each concrete plant were erected in the same truck-elevator shaft in which the plant was placed. The mixers discharged into 35-cu.ft. tower buckets, each of which was operated by a single-drum hoist belt-driven by a 100-hp. electric motor. Concrete was delivered by the buckets of the two towers to a single 4-yd. steel hopper, from which the concrete passed by a chute to the first of a series of belt conveyors used to distribute the material on the floor.

A total of sixteen Barber-Greene portable belt conveyors distributed concrete from the tower hoppers of the two mixing plants. The conveyors were of two lengths, 35 and 40 ft., and each unit was equipped with a 24-in. belt driven by a 5-hp. electric motor. Eight of the conveyors were geared to travel at 380 to 385 ft. per minute and the other eight at 460 to 475 ft. per minute. To prevent overloading of the conveyor line, the concrete crew always placed a slow-speed conveyor at the receiving end, under the chute of the tower hopper, and installed a high-speed belt at the discharge end, which usually was elevated about 10 ft. to permit distribution by chutes over a wide area. Because of the saving in labor made possible by their light weight, the contractor used aluminum chutes.

A series of conveyors comprising up to eight in number usually distributed concrete from each tower hopper. Occasionally the contractor placed more than eight conveyors in line, and at one time all sixteen conveyors were operated in a single series. Power for the conveyor motors was taken from three lines, one near each end of the building and one in the center. Each power line was capable of operating eight conveyors. The conveyor train rested on timber runways blocked up above the level of the reinforcing steel on wood horses. Conveyors were moved up from floor to floor by means of chain blocks attached to column cores or by A-frame hoists equipped with hand winches.

Rate of Concrete Placement — The concrete mixing and distributing equipment demonstrated its ability to place as much as 1,300 yd. in one day, including some overtime, and to average 1,000 yd. per 8-hr. day over a period of one week.

Belt conveyors afforded a flexible and efficient means of distributing concrete over the large floor areas. Contractors on several jobs using this type of equipment have preferred to place the belt conveyors on the floor above the one being poured, on the theory that this location facilitates operations on the working level below. At the Inland Terminal, however, the contractor was able to maintain practically continuous operation of the conveyor equipment on the floor being poured without retarding erection of formwork or placing of reinforcing steel. Repeated drop-

ping of the concrete from belt to belt gave the material a second mixing.

Formwork—The job was equipped with column and floor forms for one floor made up in sectional units for repeated use. Both column and slab forms were lined with Masonite Presdwood to leave a smooth concrete surface and reduce finishing costs to a minimum. Lining of the column sides was left intact during the entire construction of the building, but the lining of the slab forms was stripped and replaced each time the forms were moved. Workmen applied a mixture of form oil and paraffin to the lining before each pour to preserve it for repeated use.

Reinforcing Steel—A total of 5,400 tons of reinforcing steel was required for the Inland Terminal. Of this amount, about 3,500 tons was used in the form of straight bars, and nearly 1,900 tons was bent on the job, in accordance with the regulations of the New York City metal lathers' union. The contractor installed two electric motor-driven Ryerson steel benders capable of shaping bars up to $1\frac{1}{4}$ in. square on the first floor, where steel was unloaded direct from trucks.

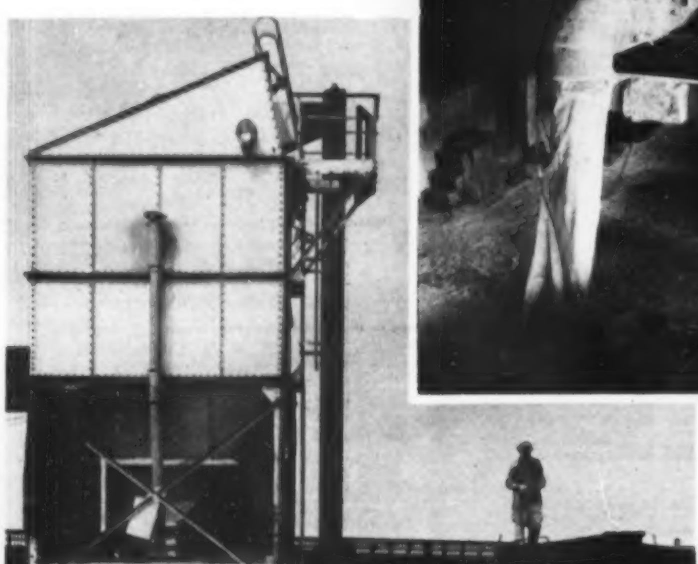
Straight steel for the upper floors was lifted in 2-ton bundles directly from the delivery trucks by a trolley hoist in one of the permanent truck elevator shafts. The trolley beams for these hoists were erected diagonally in the structural framing of the shafts near the top of the building. Steel bundles were raised and deposited on a flat car on a temporary cantilevered platform erected under one end of the trolley beam at the proper floor. The flat car, which was equipped with flanged wheels, traveled over a narrow-gage track and distributed the steel over the floor framing of the adjacent truck lobby. From this point, workmen transported the steel to its proper place on the floor of the building.

Mortar Plant — Advanced methods characterized the production of 11,000 yd. of mortar required for the masonry work on the job. A mixture of slaked lime and water in the proper proportions for the final mortar mix was delivered from a central plant of the Blue Diamond Service Corp. by motor trucks having 6-yd. steel trough-shaped bodies equipped with screws for unloading. The trucks discharged this mixture, known on the job as lime putty, into a chute which delivered it to an open bin at the mortar plant in the basement. A 3-in. centrifugal pump forced the lime putty from the open bin through a pipe line to a volume batching hopper, from which the material flowed into the mixer drum with the sand.

Sand trucks on the first floor dumped their loads into the sand bin of the plant. Bulk cement was delivered by the special bulk-cement trucks through an opening in the second floor into the cement bin. Both the sand and cement flowed by gravity to their respective hoppers.

Special $\frac{3}{4}$-yd. steel pans, 6x4 ft. by 10 in. deep, shaped like large hulls and designed to fit the skid platforms, were used in delivering mortar from the mixing plant to the bricklayers. The $\frac{3}{4}$-yd. mortar mixer discharged each batch into a steel pan on a skid platform. A lift-truck moved the loaded and empty pans on the basement floor and placed them on the hoist for delivery to the upper floors. On the upper floor, a second lift-truck delivered the loaded pans from the hoist to the bricklayers. From 40 to 50 steel pans were needed to take care of the production of the mortar plant, which amounted to 23 batches an hour.

SPECIAL CEMENT TRUCK *(left)* equipped with trough-shaped dustproof body delivers 55 bbl. of cement through canvas spout into bin under floor. Longitudinal screw in bottom of trough feeds cement to pipe at rear end. 4-YD. STEEL HOPPER *(right)* attached to two hoist towers receives concrete from both mixers and feeds mixture through chute to train of belt conveyors.



BULK-CEMENT TRANSFER PLANT. Railroad car discharges cement into track hopper from which screw conveyor elevates material to 500-bbl. bin. Special cement trucks drive under this bin to load.

Brick and Tile—Skid platforms and lift-trucks served a similar purpose in distributing brick and tile on the job. These materials were unloaded by hand from trucks on the second floor directly on to the skid platforms. Each skid platform, measuring 4x6 ft., carried a load of 750 brick, which were kept from falling off the platform by side boards. Because of the great speed with which brick could be handled on the skid platforms two hoists were sufficient to deliver an average of 175,000 brick per day from the second floor to the upper floors. Each hoist carried two skid platforms, or 1,500 brick, per trip, handling as many as 150,000 brick in 8 hr. Lift trucks moved the loaded and empty skid platforms on each floor. In addition to the saving in labor gained by this method, the practice of unloading by hand and distributing by means of skid platforms effected a great reduction in breakage of brick and tile.

Lift Trucks — Nine Elwell-Parker gasoline-electric lift trucks and 350 skid platforms handled all brick, tile and mortar for the job. The contractor chose trucks of this type for the hard service required because of their flexibility, ease of re-fueling, speed in both forward and reverse directions, short turning radius, and durability. A minor weakness of the trucks was the short length of the lift portion, which allowed little latitude for unbalanced loads on the skid platforms.

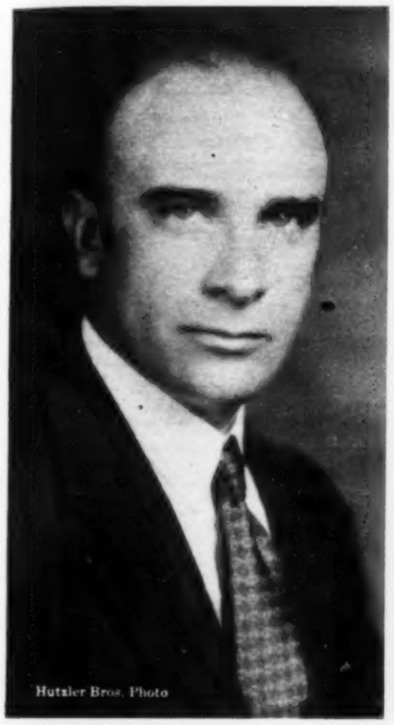
Hoist Engine Locations—In starting the job hoist engines were necessarily located in the basement or on the first floor. These two floors were scheduled for occupation by the trunk-line railroads serving New York City to handle less-than-carload freight in advance of the completion of the rest of the building. To free these two floors for early use, the contractor was obliged during the middle stages of the work to move all hoists to the second floor.

Supervision — J. C. Evans, terminal engineer, was in charge of the project for the Port of New York Authority. Abbott, Merkt & Co., of New York City, were engineer-architects of the building, and Aymar Embury II was consulting architect. W. W. Roberts, Jr., superintendent, directed operations for the Turner Construction Co.

Present and Accounted For —

A Page of Personalities

Engineer and Contractor Members of Code Authority's Construction Appeals Board



WILSON T. BALLARD, chairman; member of firm of J. E. Greiner Co., consulting engineers, Baltimore, Md.

JOHN W. COWPER, president of John W. Cowper Co., contractor, Buffalo, N. Y.

R. B. HOWLAND, assistant to president, United Engineers & Constructors, Inc., Philadelphia, Pa.

W. R. SMITH, president, Lane Construction Co., road building contractor, Meriden, Conn.

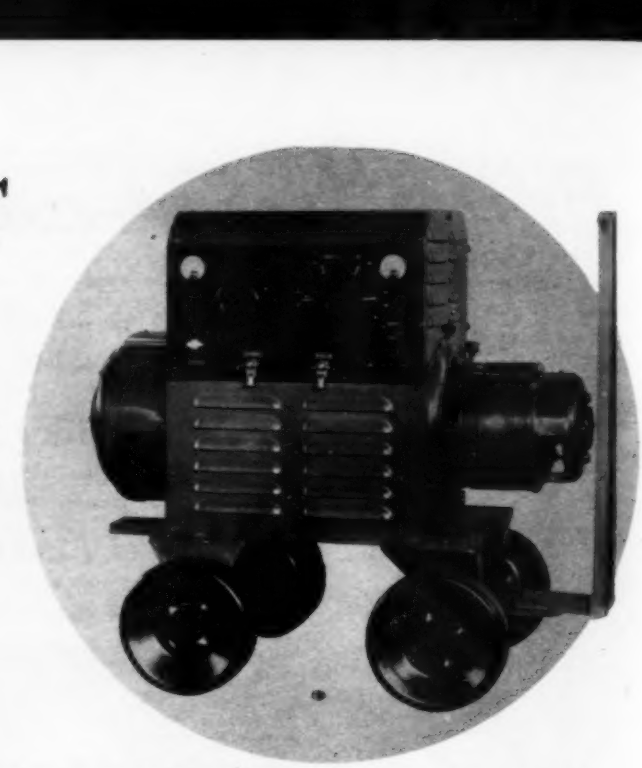
COL. B. R. VALUE, formerly deputy administrator, Construction Division, NRA, has been appointed executive director of the Construction Code Authority.

COL. HORATIO B. HACKETT, partner in the firm of Holabird & Root, architects, of Chicago, has been named, by Administrator H. L. Ickes, general manager of the Public Works Emergency Housing Corporation, which has received an allotment of $100,000,000 for a construction program of low-cost housing and slum clearance.

MAJOR ROBERT N. CAMPBELL, formerly assistant deputy, has been promoted to be deputy administrator in charge of the Construction Division of NRA at Washington.

NEW EQUIPMENT ON THE JOB

HIGH-CARBON-STEEL DRUM on new 1934 Rex Paver, designed for fast adequate mixing, is built with strength and resistance for handling capacity batches on fast schedules. Has replaceable liners on each of 12 big alloy-steel buckets, on its 6 heavy blades, and in its charging head. Rubber sealing rings prevent leakage with low-slump concrete. Mechanical man performs seven operations necessary to get mixed batch into bucket and governor booster speeds up drum and skip for faster charge and discharge.—Chain Belt Co., Milwaukee, Wis.



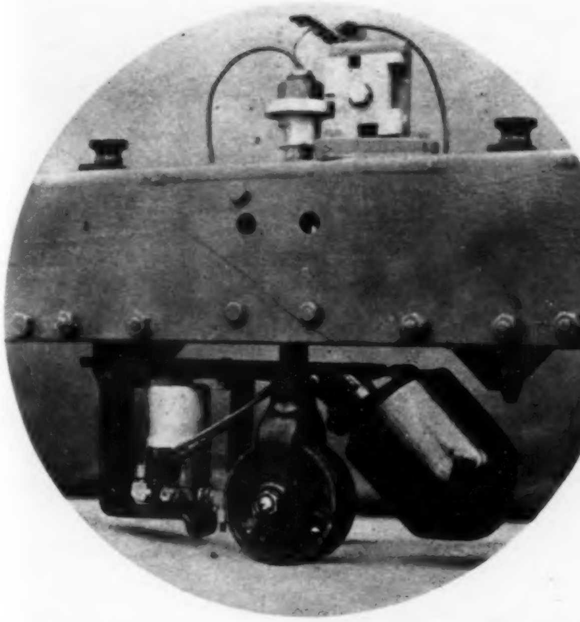
PORTABLE ARC WELDER has eliminated need for reactors by obtaining arc stabilizing effect through adjustments within welding generator itself; has reduced to minimum time required for starting and time consumed in maintaining arc; and has substantially raised overall efficiency of unit through eliminating current-consuming reactors (overall efficiency of induction-motor-driven welder is approximately 70 per cent. Figuring electric energy at 1 cent to $1\frac{1}{2}$ c. per kw.-hr., it is claimed that saving in power and time will themselves return 6 per cent annually on original cost of machine. Weighs 1,500 lb.; is a 200-amp., 40-v. unit; has four main current steps with better than 600 adjustment steps possible, ranging from 60 to 250 amp.—Universal Power Corp., 1719 Clarkstone Rd., Cleveland, Ohio.

12-FT. BLADE GRADER has new operating features. Austin No. 11 may be equipped for either hand or power leaning of front and rear wheels. Welded box frame provides added strength and rigidity. Direct draft from tractor drawbar through pole to circle and blade. Blade 20 in. high can be raised 17 in. above ground or tilted to angle of more than 70 deg. to cut 2:1 slope.—Austin-Western Road Machinery Co., 400 N. Michigan Ave., Chicago, Ill.

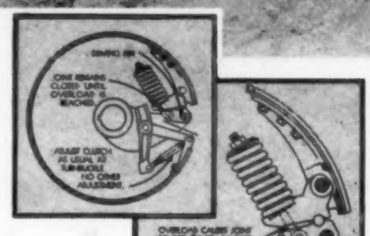
DRILLS HOLES IN ANY DIRECTION. Wagon drill has automatic air feed cylinder which serves as boom or support for guideways on which slab back mounted machine travels when being fed into or reversed away from rock. Boom is mounted on offset U-bar which can be fixed in any position around center line of wheel axle, an arrangement which permits drilling of down holes, *(right)*, flat holes or

holes at any angle between these extremes *(above)*. When feeding into rock, mechanism automatically maintains machine in correct position for fastest cutting. When reversing, or approaching rock, speed may be varied from few inches to 25 ft., or more; per second. Provided with special blower controlled by lever which turns full pressure through a $\frac{3}{4}$-in. hole into the chuck chamber at end of shank, automatically short stroking hammer and blowing any hole.—The Cleveland Rock Drill Co., Cleveland, Ohio.

FREE-RUNNING POWDERS *(right)* consisting of dynamite of special grades in loose form, known as "Red Cross Blasting Nos. 2, 3 and 4, F.R.", have been developed for use in sprung holes. No. 2 F. R. is specially adapted for replacing black powder in this work, as field experience shows that 60 to 75 lb. of free running powder will replace 100 lb. of black powder. Nos. 3 and 4, F.R., are adapted for top loads in certain types of well drill work because they completely fill hole. No. 4, F.R., is valuable in road work, replacing slow process of using stick dynamite.—E. I. Du Pont de Nemours Co., Wilmington, Del.



SOLENOID-OPERATED VALVE on road surface tester marks high spots and depressions on newly laid roads. Tester, manufactured by H. & H. Manufacturing Co., of Elyria, Ohio, consists of framework on wheels on which is mounted a free moving roller with extension arm constructed so that roller can follow profile independently of truck wheels. Upper part of extension arm is arranged to establish contact if roller moves in either direction beyond permissible limits. When contact is made G-E solenoid valve, mounted on frame, is energized, opens, and squirts a stream of marking fluid on defective spot. Established contact also lights indicating lamp on upper part of road tester so that preliminary inspection of defective spots may be made at once. Lamp and solenoid valve operated from 6-v. battery on tractor which pulls tester.—General Electric Co., Schenectady, N. Y.



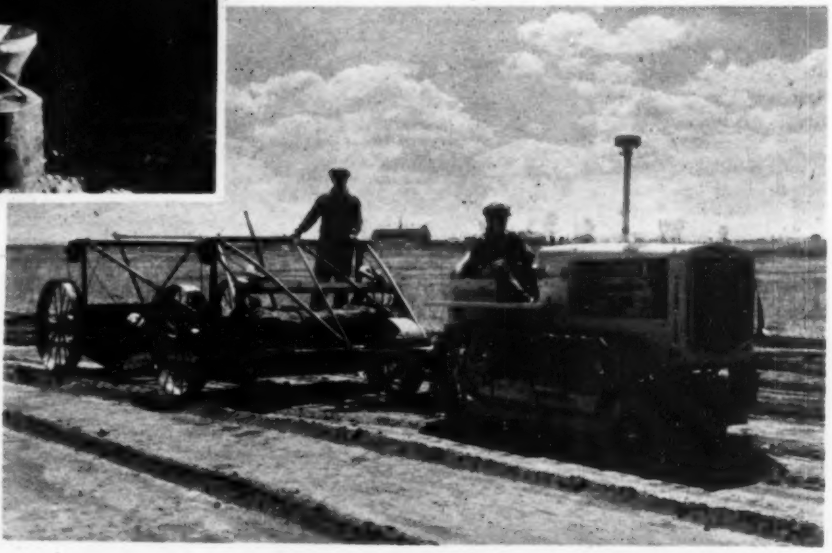
CUSHION CLUTCH on larger sizes of Northwest machines is an overload release in main clutch of hoist drum, limiting hoist-rope pull to definite maximum tension. Device transmits full power of engine to operating functions and at same time reduces maximum stresses on every part under power when hoist rope is overloaded. This control diminishes maximum loads on drum shaft, reduces clutch adjustments, and increases cable life. In operation, new clutch acts as cushion against shocks, permitting main clutch to slip gently when overload point is reached. Operator has from three to five times as long to throw out main clutch lever to prevent engine from stalling. Machine equipped with cushion clutch is working on state road near Los Angeles, and is owned by Jahn & Bressi.—Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.

If You Want Further Information—

Within the space limits of this page it is impossible to present complete information about the products illustrated.

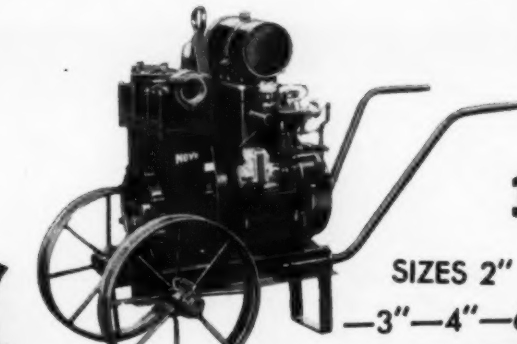
The manufacturers, however, will be glad to supply further details if you will write to them.

"SURE PRIME" centrifugal pump eliminates usual hand adjustment for different lifts or for recirculation cut-off, is 100 per cent automatic and has large air capacity for quicker priming and handling of air leaks. Self-priming at lifts above 25 ft. Built in 2-, 3-, 4-, 6- and 8-in. sizes, capacities 10,000 to 125,000 g.p.h. Pumps shown are 6-in., pumping cofferdam on Missouri state highway bridge job at Eminence, Mo., List & Clark, contractors. Oversize engine with variable speed control, Timken or ball bearings on impeller shaft and water passages 3 to 10 times bigger than pipes. "Lubri-Seal" which eliminates packing and self-cleaning shell design are other features.—The Jaeger Machine Co., Columbus, Ohio.



RUBBER-TIRE REPLACEMENT ASSEMBLIES, (*left*), known as "Air-Lode-Carriers," for use on all makes of wagons. Because of easy rolling resistance they afford fuel saving as high as 35 per cent for tractors hauling wagons. Low-pressure tires and oscillating feature enable load to be carried over very soft soils with same bearing surface on ground as provided with wagon tracks. Rear wheel arranged as caster enables it to make short turn. Special locking arrangement permits caster-wheel to be locked for backing.—La Plant-Choate Mfg. Co., Cedar Rapids, Iowa.

TRIPLE ECONOMY of low first cost, operation on inexpensive fuels and power savings of track-type traction are among features of this new "22" tractor. Powered by four-cylinder, four-cycle, valve-in-head engine which has 4-in. bore and 5-in. stroke and develops maximum horsepower of 23.69 at drawbar and 28.39 on belt at governed speed of 1,250 r.p.m. Twin fuel tank holds 20 gal. of tractor fuel and 2 gal. of gasoline for starting. Three-way fuel control valve located on dash in easy reach of operator. Available in either standard- or wide-gage models. Shipping weight, 6,150 lb.—Caterpillar Tractor Co., Peoria, Ill.



New 2" Novo

Injecto Prime

Self Priming Centrifugal Pump

10,000 G.P.H.

SIZES 2"
—3"—4"—6"

Helps to SUCCESSFUL CONTRACTING
NOVO EQUIPMENT

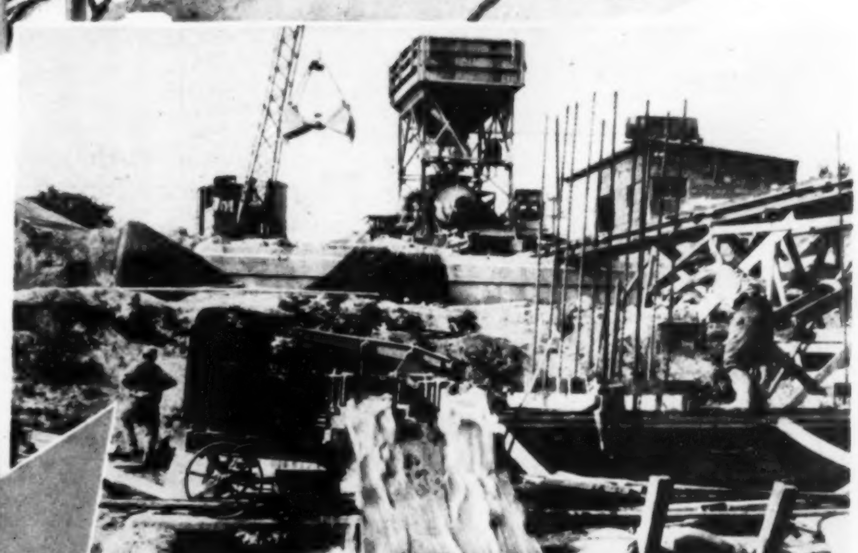
This Novo 5" Three Stage Jetting Pump is proving the most successful method of jetting fills on State Highway Construction. Pump capacity 700 G. P. M. — 270' head — operating 15 jets.

These close up shots of successful jobs point out clearly how Novo Equipment can put your job over at a profit.

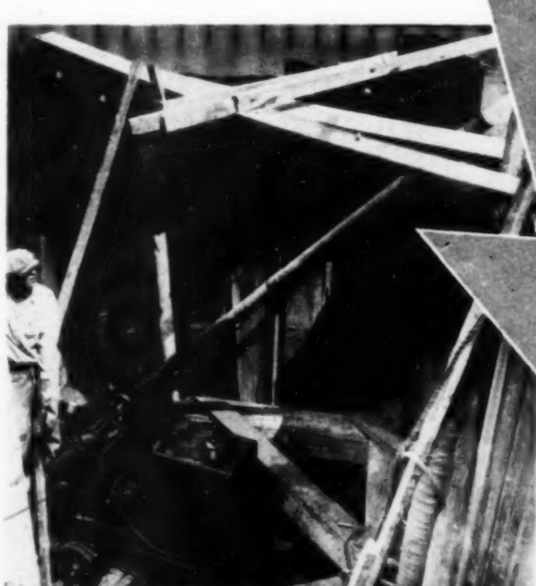
Get the full details of the New "Injecto Prime" Self Priming Centrifugal Pumps.

There is a full line of Novo Portable Light Plants.

All sizes of Builders and Dragline Hoists.



This Novo 4" Double Diaphragm Pump is really pouring out the water from the footings on this bridge job. A real dependable and economical water handler.



Dewatering a cofferdam on bridge job with a Novo 4" Self Primer — 14' suction — 20' discharge head — and throwing plenty of water. It has the New Injecto Prime Principle.

NOVO
PUMPS — ENGINES — HOISTS

THIS COUPON BRINGS THE DETAILS YOU WANT

NOVO ENGINE COMPANY, 214 PORTER ST., LANSING, MICH.

I've checked below the printed matter to send me. Please send it to

Name .... Address ....

- ☐ Novo Self Priming Centrifugal Pumps.
- ☐ Novo Triplex Flud Oil Road Pumps.
- ☐ Novo Pressure Pumps.
- ☐ Novo Diaphragm Pumps.
- ☐ Novo Centrifugal Jetting Pumps.
- ☐ Novo Flud-Lite Lighting Units.
- ☐ Novo Dragline and Slackline Excavating Hoists.
- ☐ Novo Hoists.

GAS-ELECTRIC ROAD FINISHERS
DIRTMOVERS
Headquarters for ROAD BUILDING EQUIPMENT
BULK CEMENT PLANTS
MORE than ever before, the Blaw-Knox 1934 line of construction equipment exactly fits contractors present and future requirements. New developments and amazing improvements in equipment are in step with projected programs and specifications.
Blaw-Knox equipment helps the contractor to maintain schedules and complete his work on time. It is low in maintenance costs and pays for itself quickly in service. It is modern and in many instances has anticipated specifications.
It's a twenty-eight year old custom among contractors to "deal with Blaw-Knox". This is an especially good habit to continue as it marks the maximum worth in equipment, satisfaction and service to be obtained for the dollar expended.
BLAW-KNOX COMPANY
2086 Farmer's Bank Bldg. Pittsburgh, Pa.
Offices and Representatives in Principal Cities
ROAD FORMS
REINFORCED LOCK JOINT
BULLDOZERS
TRUKMIXERS
CLAMSHELL BUCKETS
AUTOMATIC BATCHERS
for Aggregates, Cement and Water
BATCHERPLANTS
BLAW-KNOX
LEADERSHIP
CONSTRUCTION EQUIPMENT
also includes —
STEEL FORMS FOR GENERAL CONCRETE CONSTRUCTION
STREET AND SIDEWALK FORMS
TRUCK TURNTABLES
CEMENTANKS
TAMPING ROLLERS
PORTABLE ASPHALT PLANTS
CENTRAL MIXING PLANTS
READY MIXED CONCRETE PLANTS
TREMIE BUCKETS
STEEL BUILDINGS
STEEL GRATING
BLAW-KNOX

KOEHRING

MOVE DIRT the KOEHRING WAY

Carving a road out of the rugged bluffs along the Mississippi River in Wisconsin is the job of Nolan Brothers Contracting Company of Minneapolis. To assure continuous operation with maximum production they chose to use the Koehring method of dirt-moving — a Koehring Shovel and a fleet of 4 Koehring Wheel Dumptors.

KOEHRING HEAVY DUTY

SAVE WITH A KOEHRING SHOVEL AND KOEHRING WHEEL DUMPTORS » » »

A Koehring Shovel with ample power for the tough digging — without nibbling at the bank — with the boom shock absorber to reduce operating strains — with finger tip ease of control, without mechanical complications, for high speed operation.

The Koehring Wheel Dumptor is quickly spotted under the shovel dipper — gets away speedily — fast travel to the dump without turning — because of three speeds forward and reverse. Hauling, dumping and spreading with the Koehring Wheel Dumptor will reduce costs — because of instantaneous gravity dump, wide body for easy loading, one man operation, short turning radius.

Send for Shovel and Dumptor Catalog A5.

THE KOEHRING SHOVEL AND DUMPTOR IS THE ECONOMICAL DIRT-MOVING COMBINATION

KOEHRING COMPANY

MILWAUKEE *Division of National Equipment Corporation* WISCONSIN

• Improved resistance to skid • Safe—wet or dry • Comfortable under foot • Easy traction for wheeled vehicles • Easy to clean • Drains readily • Attractive and modern in appearance • No cutting waste

FOR MAXIMUM SECURITY SPECIFY MULTIGRIP FLOOR PLATE

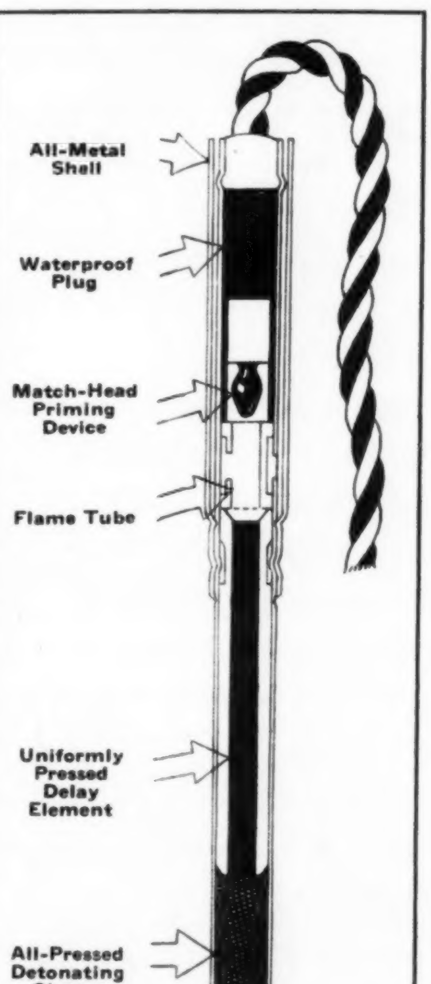
Illinois Steel Company

208 SOUTH LA SALLE STREET, CHICAGO, ILLINOIS

SUBSIDIARY OF THE UNITED STATES STEEL CORPORATION

The "Tunnel Stiff" Knows . . .

"In tunnel construction, from the first shot down the hole to the last blast, Delay Electric Blasting Caps must perform with split-second regularity to get the greatest footage."



It is regularity of firing of Delay Electric Blasting Caps that makes tunnel footage. If a third delay goes off before a second, or a fifth delay before a fourth, the explosive forces are either wasted or over-burdened and do not do the work they should. The selection of the best grade of explosives, proper drilling and the best procedure of the blasting process lose much of their effectiveness unless the round is fired with accurately timed Delays.

Atlas All-Metal Delay Electric Blasting Caps have outstanding advantages in construction and design that definitely stamp the Atlas Delay with leadership. The Atlas Delay has no rubber tube—no fuse. Its construction affords full moisture resistance. Its unique safety features effectively guard against accidental firing. It assures accurate timing.

Avoid misfires and overlapping. Specify Atlas Delay Electric Blasting Caps. Let the Atlas Representative show you.

ATLAS POWDER COMPANY

Everything for Blasting

WILMINGTON · DELAWARE

Cable Address—Atpowco

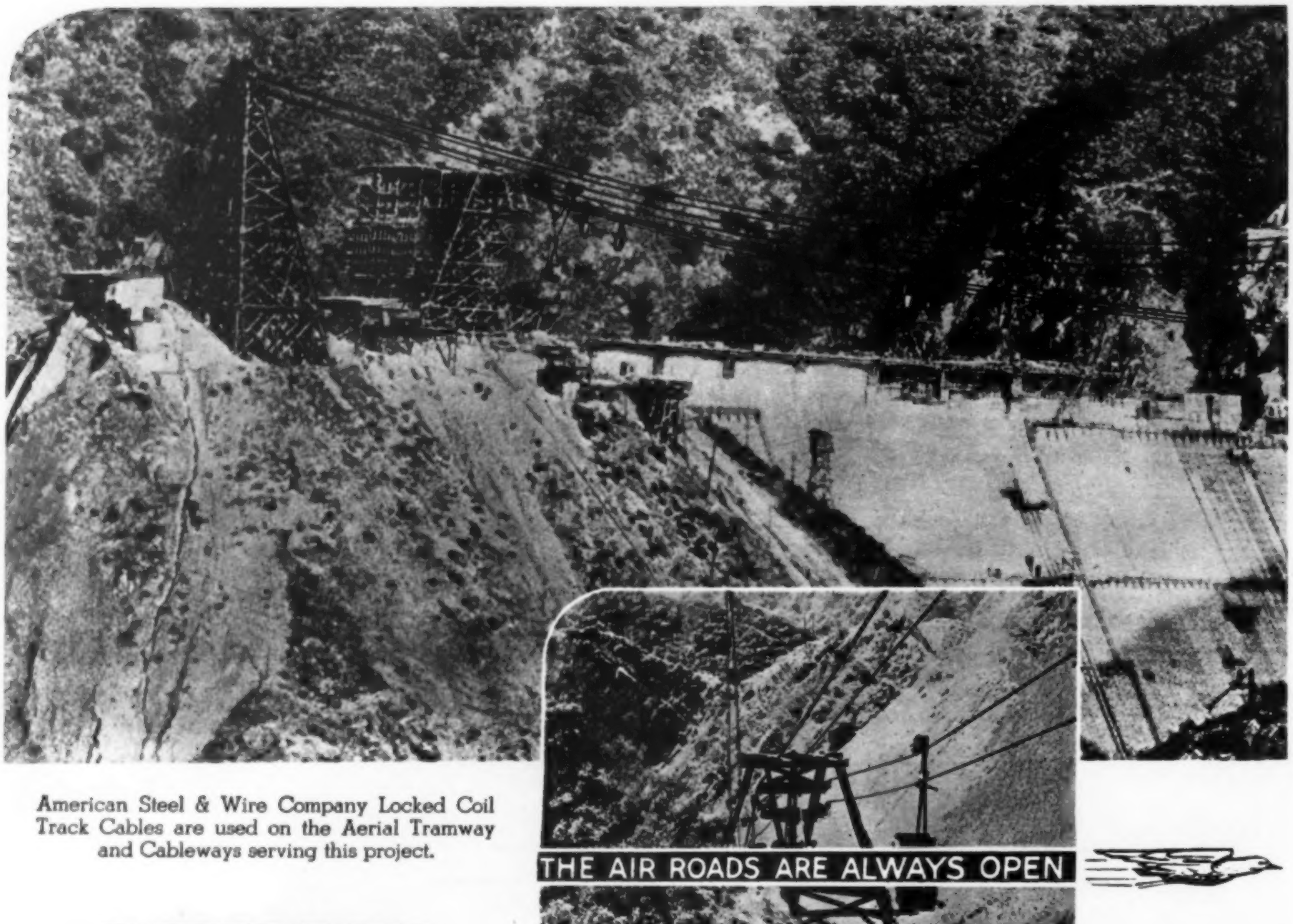
OFFICES

Allentown, Pa.	Kansas City, Mo.	Philadelphia, Pa.	Seattle, Wash.
Boston, Mass.	Knoxville, Tenn.	Pittsburg, Kansas	Spokane, Wash.
Butte, Mont.	Los Angeles, Calif.	Pittsburgh, Pa.	St. Louis Mo.
Denver, Colo.	Memphis, Tenn.	Portland, Oregon	Tamaqua, Pa.
Houghton, Mich.	New Orleans, La.	Salt Lake City, Utah	Wilkes-Barre, Pa.
Joplin, Mo.	New York, N. Y.	San Francisco, Calif.	

ATLAS EXPLOSIVES

ATLAS

EXPLOSIVES



American Steel & Wire Company Locked Coil Track Cables are used on the Aerial Tramway and Cableways serving this project.

AERIAL TRANSPORTATION AT PINE CANYON WATER SUPPLY DAM

LIKE the swift flight of a bird—at a speed of 500 feet per minute—the aggregates supply for the Pine Canyon Water Supply Dam at Azusa, California, is easily and economically transported, over a distance of 2 miles, by an American Steel & Wire Company Aerial Tramway. The capacity of this tramway is 235 tons per hour. In this—and in many similar instances—there are no aggravating delays due to ground or weather conditions—no costly expenditures of time and labor. Instead—American Steel & Wire Company Aerial Tramways carry hundreds of tons of material an hour to and from locations inaccessible by surface routes at an extremely low cost per ton mile. Perhaps you would like to have specific information regarding the adaption of these modern carriers to your own haulage problems. The story is an interesting one—and we invite you to request complete details from us.

1831 MORE THAN 100 YEARS of PROGRESS IN WIRE MAKING 1934

AMERICAN STEEL & WIRE COMPANY

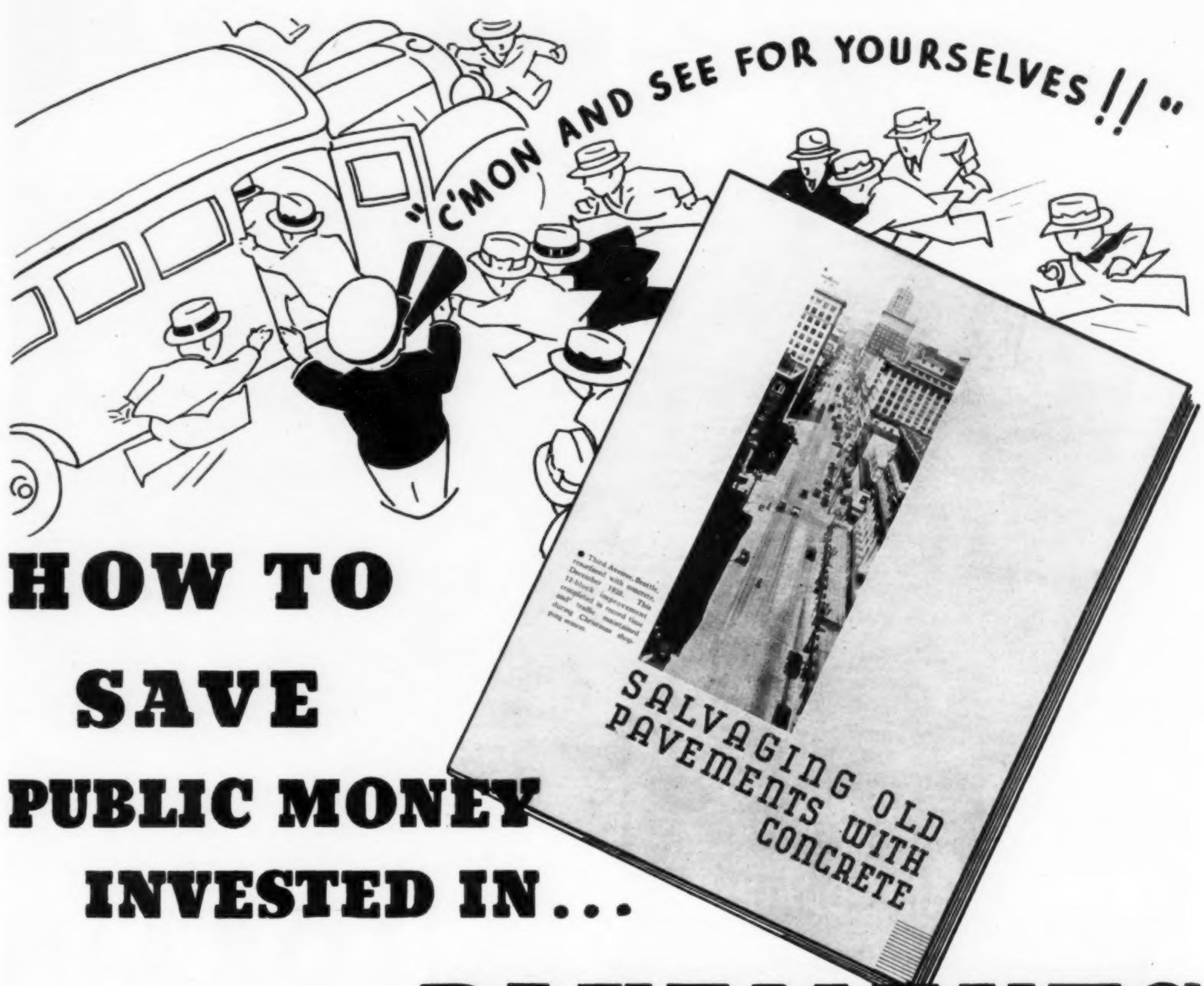
208 South La Salle Street, Chicago
94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION
AND ALL PRINCIPAL CITIES

Empire State Building, New York
First National Bank Building, Baltimore

Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco

Export Distributors: United States Steel Products Company, New York



HOW TO SAVE PUBLIC MONEY INVESTED IN . . .

PAVEMENTS

ALL ABOARD for a nation-wide tour! Let's take a look at the resurfaced pavements that are saving millions for taxpayers all over the United States!

Here's the book that takes you around. It's called "Salvaging Old Pavements With Concrete." It tells the story with pictures and facts. It hands you all the essentials for good resurfacing . . . the results of experience gathered over more than 20 years. It shows you how rough roads are smoothed out for keeps . . . how thin pavements are strengthened to carry today's traffic. It shows you what to expect of your old pavements properly resurfaced with concrete.

This . . . and more, you'll find in this interesting new book. It's yours for the asking.

Write now for your copy of "Salvaging Old Pavements With Concrete." Use the coupon.

MAIL IT TODAY!

THE PORTLAND CEMENT ASSOCIATION
Room 863, 33 West Grand Avenue, Chicago, Ill.
Please send me free copy of your new booklet, "Salvaging Old Pavements With Concrete."

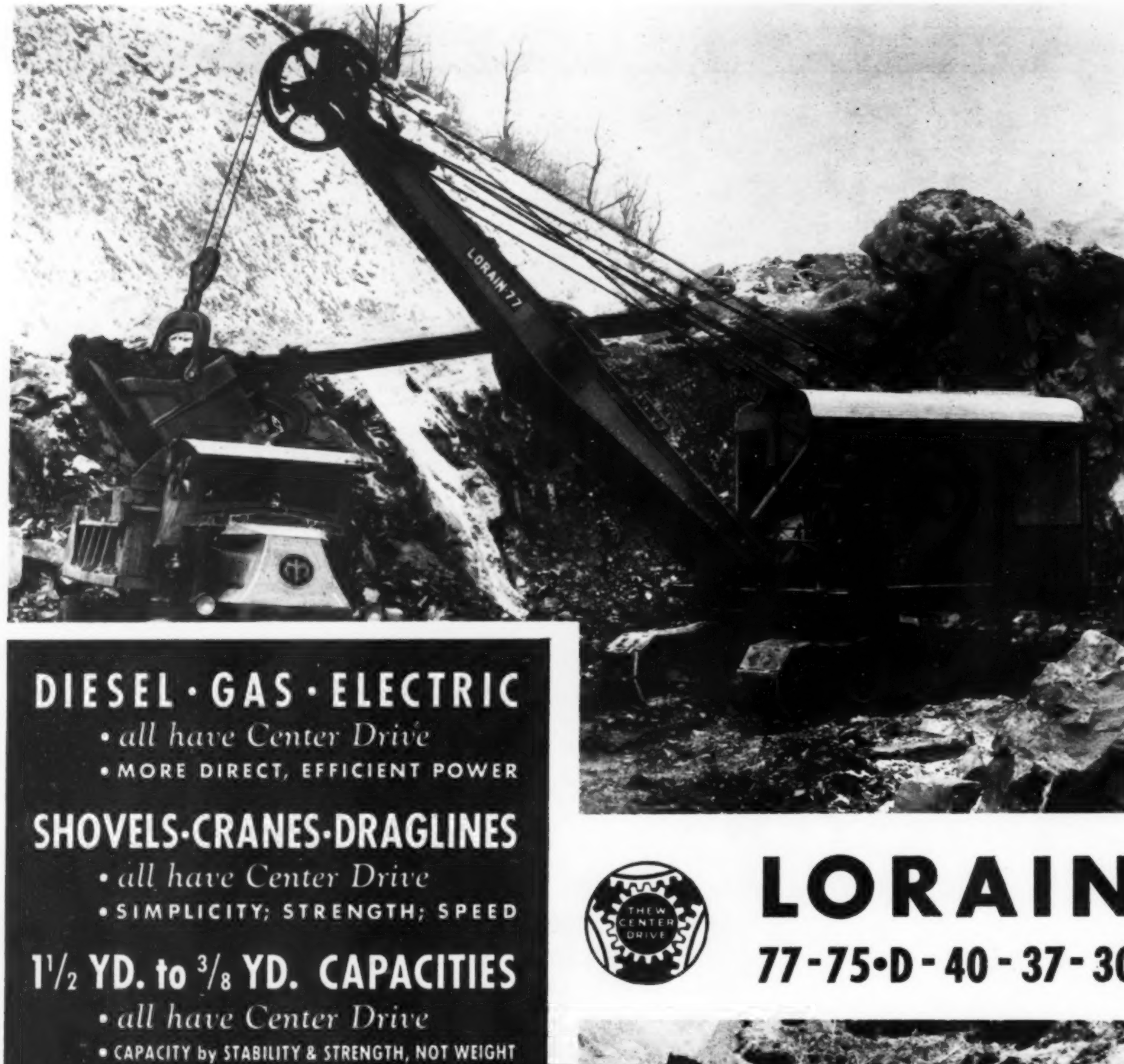
Name ....

Street and No. ....

City.................................... *State*....................

PORTLAND CEMENT ASSOCIATION

Room 863, 33 West Grand Avenue *Chicago, Illinois*



DIESEL · GAS · ELECTRIC

• *all have Center Drive*

• MORE DIRECT, EFFICIENT POWER

SHOVELS·CRANES·DRAGLINES

• *all have Center Drive*

• SIMPLICITY; STRENGTH; SPEED

$1\frac{1}{2}$ YD. to $\frac{3}{8}$ YD. CAPACITIES

• *all have Center Drive*

• CAPACITY by STABILITY & STRENGTH, NOT WEIGHT

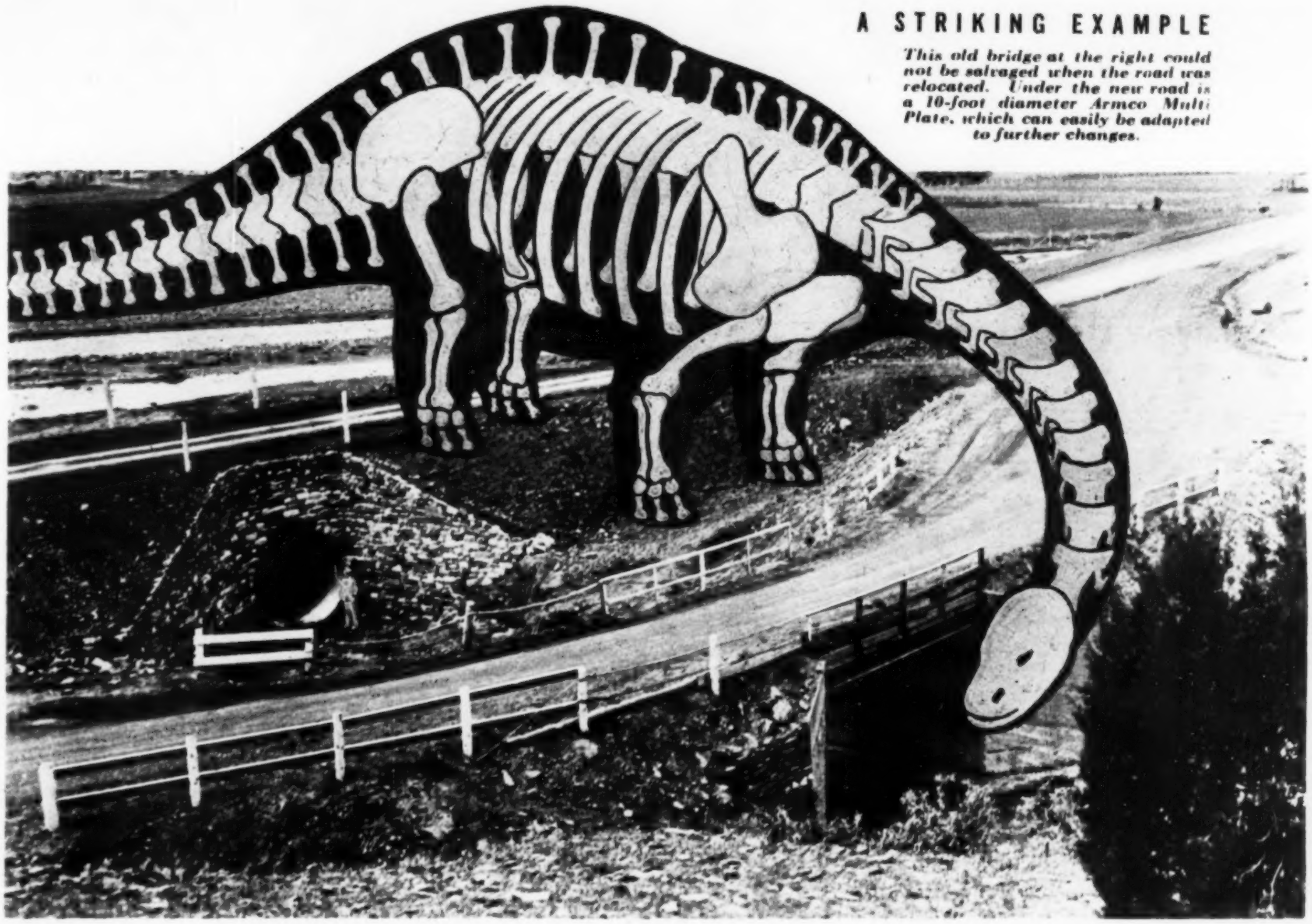
THE THEW SHOVEL CO. • LORAIN, O.

THE UNIVERSAL CRANE CO. • LORAIN, O.

THEW CENTER DRIVE

LORAIN

77-75•D-40-37-30



A STRIKING EXAMPLE

This old bridge at the right could not be salvaged when the road was relocated. Under the new road is a 10-foot diameter Armco Multi Plate, which can easily be adapted to further changes.

Only the Fit *Can Survive* Change

Scientists tell us that millions of years ago, dinosaurs were the dominant form of life on earth. Today these huge reptiles are completely extinct because they could not adapt themselves to changing conditions.

In roadbuilding, too, conditions are changing constantly. Look at the roads built just fifteen or twenty years ago. They were considered permanent. But already, many of them are proving inadequate and unsafe for present-day traffic. And nobody knows what the traffic of tomorrow will be.

So, naturally, it's wise to choose materials that can be adapted to this inevitable change—with the least possible trouble and expense. That's why more and more engineers are using Armco Multi Plate for bridges and large drains. Either in circular or arch design, it's bound to last a life time. And more important—it can easily be widened, extended, or moved to other locations—with 100% salvage value.

That's worth remembering. And remember, too, that Armco engineers are always at your service in fitting Multi Plate to your individual problems.

CALL IN AN ARMCO ENGINEER

☐ Please send me your 32-page booklet on Armco MULTI PLATE

Name ....

Title ....

Address ....

I am ☐ engineer ☐ contractor

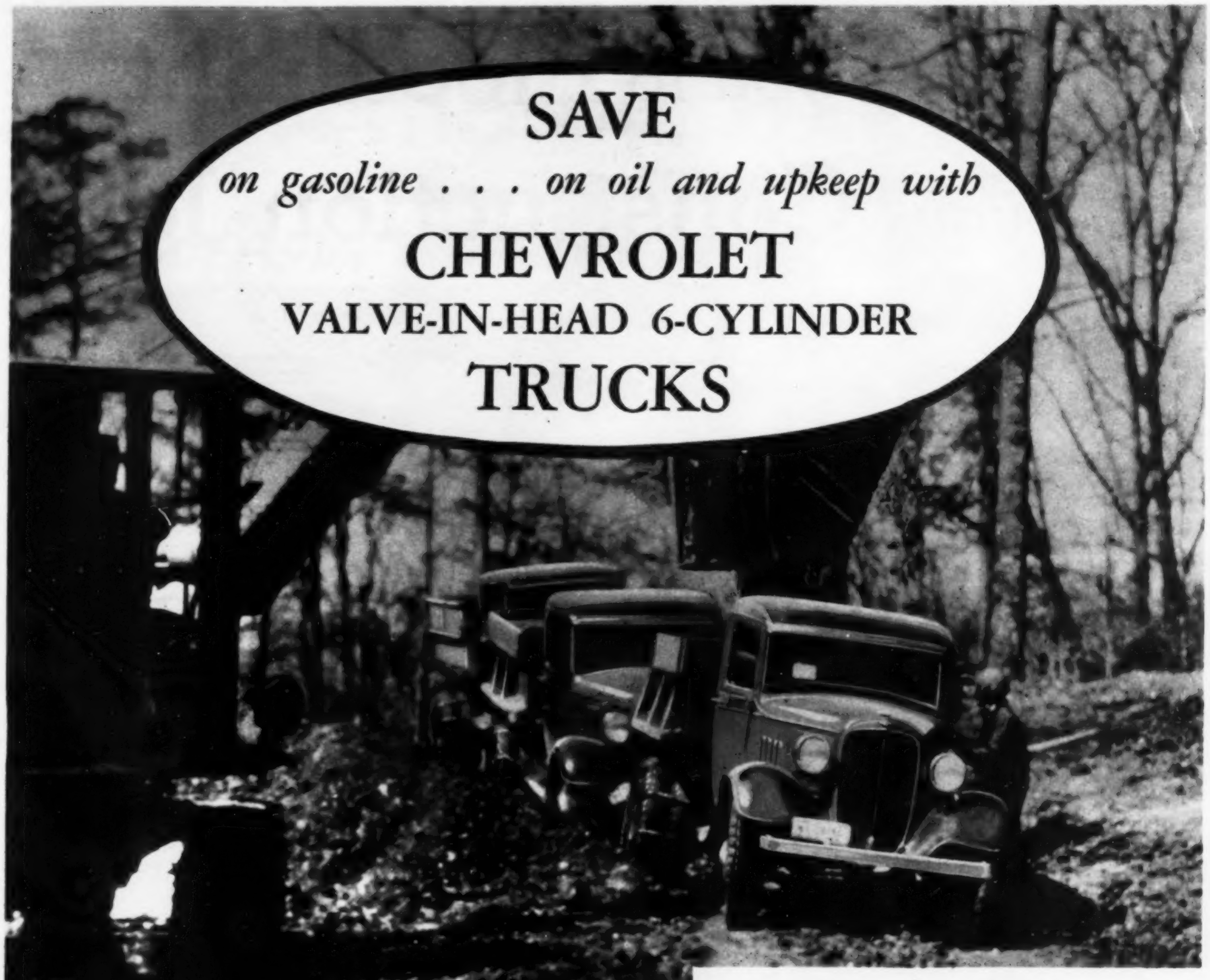
☐ official ☐ student

CM-7

ARMCO CULVERT MANUFACTURERS ASSOCIATION

Headquarters: MULTI ARMCO PLATE *Middletown, Ohio*

BUILD FOR THE FUTURE WITH ARMCO MULTI PLATE



173,000 MILES and still going strong!

This Chevrolet tractor-truck has covered 173,000 miles since Kniffen Brothers of Fort Wayne, Ind., bought it in 1931. No repairs were necessary in the first 86,000 miles. The tractor has hauled "tough loads the year 'round" but still has the original clutch and brake linings.

Wise truck owners keep a sharp eye on hauling costs. Their exact records tell which trucks cost less to run. That explains why big fleet operators and thousands of single-truck owners have been switching to Chevrolet trucks. They know that the Chevrolet six-cylinder Valve-in-head truck engine saves them money—on gas, oil and upkeep. They know that Chevrolet trucks give them smooth performance and plenty of reserve power without any needless extra cylinders. These and many other points of superior design have made Chevrolet America's *fastest selling truck*. Such overwhelming popularity is a reliable guide to follow. You can handle every job at a much lower cost by hauling with Chevrolets—the world's lowest-priced six-cylinder trucks!

HEAVY DUTY REAR AXLE. *Built for starting and pulling the heaviest loads. A straddle-mounted pinion, 4-pinion differential, over-size axle shafts, double-row wheel bearings, one-piece housing with big removable plate, give this axle extra strength and longer life.*

CHEVROLET MOTOR COMPANY, DETROIT, MICHIGAN

Compare Chevrolet's low delivered prices and easy G.M.A.C. terms. A General Motors Value.

It will pay you to Floodlight *your* Construction Jobs

A copper-bronze floodlighting projector, ideal for permanent installations at such places as warehouses, docks, and quarries

A low-cost, aluminum floodlighting projector, suitable for construction installations

A low-cost open-type floodlight, easy to install and maintain

Floodlighting performs four important duties:

1. It makes it possible to carry on work after dark with daytime efficiency. This enables the contractor to take advantage of the more favorable night-time traffic and temperature conditions, and to do emergency work or to fulfill more easily the time requirements of his contracts.
2. It adds to the safety of work that is carried on after dusk.
3. It is the surest, cheapest method of minimizing the loss resulting from theft of equipment and materials at night.
4. It provides a method of advertising that can be equalled in no other way.

General Electric's complete line of floodlighting equipment includes three types of projectors that are adaptable to the floodlighting of construction work.

The 1000-watt copper-bronze projectors have been used extensively on all types of construction work. These floodlights are made entirely of non-rusting parts, with a silvered-glass reflector and a heat-resisting door glass. You can obtain practically any type of light distribution by selecting the proper combination of reflector, lamp, and door glass.

The low-priced 1000-watt aluminum projector is designed for temporary installations. It is a light-weight, enclosed unit, easy to install and easy to maintain, and gives a good distribution of light.

The new low-priced open-type floodlight is a sturdily built unit of sheet steel, finished with a double coat of baked enamel. Any lamp from one of 300 watts to one of 1500 watts can be used with it.

GENERAL ELECTRIC

Docks illuminated by G-E copper-bronze floodlights

GENERAL ELECTRIC COMPANY
Department 6-201, Schenectady, N. Y.

Please send me Publication GEA-1505,"Floodlighting for Outdoor Construction".

Name ....

Company ....

Address ....

500-105

INTERNATIONAL HARVESTER

offers you

A complete and efficient line of Industrial Tractors

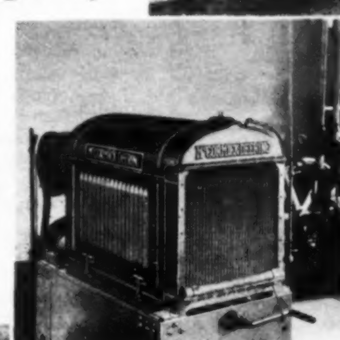
Here is the new McCormick-Deering I-12 *ready to show these men something new in performance. May we demonstrate this tractor to you?*

See description at foot of page.

GREAT CHANGES are taking place today in *the application of mobile power to industrial need.* In this field International Harvester has done much modern pioneering during the recent difficult years. It is ready today with a new order of flexible and versatile industrial power. McCormick - Deering power—*wheel tractors, crawler tractors, power units, gasoline and Diesel development*—is closely geared to the times.

International Harvester is one of the soundest corporations in America—sound in engineering and resourcefulness, sound in its organization. This Company, the world's largest tractor builder, backed by an unparalleled network of service reaching every community, is at your command. Study the brief McCormick-Deering story on this page and inquire of our distributors and branches.

INTERNATIONAL HARVESTER COMPANY
OF AMERICA
(Incorporated)
606 So. Michigan Ave. Chicago, Illinois



● **WHEEL-TYPE INDUSTRIAL TRACTORS** in four sizes. This is the McCormick-Deering I-30 and road grader. Highway builders know from years of operation what McCormick - Deering efficiency means.

● **McCORMICK - DEERING POWER UNITS,** in four sizes, are at work in every conceivable type of installation, driving crushers, gravel conveyors, pumps; operating elevators, shovels, graders, excavators, and mixers; generators, locomotives, and dredges; working in factories, mills, mines, lumber, and oil camps.

● *At Left:* **McCORMICK-DEERING MODEL T-40 TRACTRACTOR,** equipped with Trailbuilder. The two TracTracTors, Models T-40 and T-20, are by *far* the most accessible crawler tractors built.

The T-40 TracTracTor is provided with 4-cylinder Diesel or 6-cylinder gasoline engine. This Diesel engine is designed to start easily as a conventional gasoline engine and is then converted almost automatically and instantaneously to Diesel operation.

● *See Upper Illustration:* **THE NEW McCORMICK-DEERING MODEL I-12** is a compact and flexible tractor only 99 inches long, about 4 feet wide, and turning completely in a circle of 8½-foot radius. Continuous operation on a gallon of gasoline, or less, per hour. Here is power and utility of a quality hitherto unavailable, for speedy operation around factories and shops, docks, and warehouses; for municipal and park service; for golfcourses (the new "Fairway 12"); public utility, lumbering, railroading, and interplant activity.

McCORMICK - DEERING


LeTOURNEAU
LE TOURNEAU
ADAPTABILITY
ALL CONDITIONS
ANYWHERE
ANYTIME
LeTOURNEAU
The Photographs
Above. On the Northern Rim of the Mojave Desert. 12 Yard Carryalls outfit working day and night, removing over-burden from a gold deposit.
Left. Angledozer in Sequois National Park.
Right. One of a fleet of seven, 25 yard 8 wheel Buggies building levee along the Mississippi River, near Memphis, Tenn.
Below. 12 Yard Carryalls, Bulldozer and rooter on the Redwood Highway, Calif.
Le Tourneaus are the solution to your 1934 dirt moving problems. Dependable always — Faster — Cheaper.
Let our Engineering Department tell you about the modern excavation methods, by photograph, data sheets, facts and proven figures. We will show you how Le Tourneaus pay.
R. G. LE TOURNEAU, INC.
P. O. Box 1290 STOCKTON, CALIFORNIA

More Strength Where It Is Needed

The
"FAVORITE"
Reversible Ratchet
WRENCH

New Model

Made of a stronger metal so that the Handles, Heads and Pawls are greatly strengthened to stand the rough usage to which a nut wrench is subjected.

Can be used in narrower places than an ordinary wrench.

The design of the "FAVORITE" Wrench is simplicity itself, having no complicated parts necessitating expensive machine work. It is an efficient time-saving tool at a proper price.

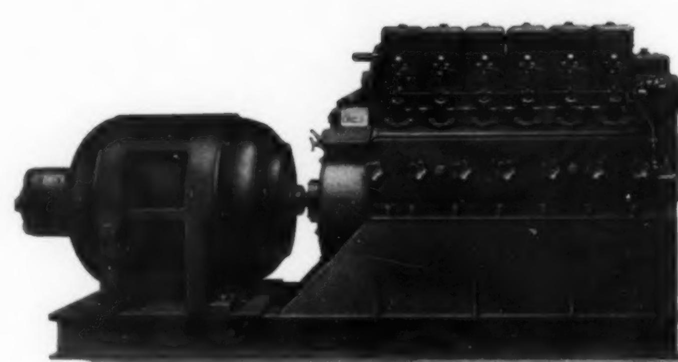
Works on a quick straight-ahead ratchet movement, and the socket form of head is not removed from nut until operation is completed.

Reverse motion instantaneous by simply turning pawl.

A Time-Saver

Send for full particulars.
GREENE, TWEED & CO.
Sole Manufacturers
109 Duane St. New York

Now you can take DIESEL POWER *right to the job!*



The new F-M light weight high speed Diesel brings Diesel economy right to the job that is "on the move" or only temporarily stationary.

This engine is light enough for truck mounting or other forms of easy transportation. It is big enough, 10 to 60 h.p., one to six cylinders, to furnish light for night operations, it's big enough to furnish "air" to a lot of pneumatic tools. It will operate a good sized hoist. It will drive grinders, hammers or any other tools you must use on the job. It's the cheapest form of power you can use on a mixer or paver. It will drive a pretty big pump.

This engine enables you to take plenty of economical power right to the job or along with the job as it progresses. It means the cheapest form of power known to engineering has become available to the construction industry.

These engines are furnished, as you desire, with or without generator, pump or compressor.

For full information write Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 32 branches at your service throughout the United States.

Pioneer Designers and Manufacturers of POWER, PUMPING AND WEIGHING EQUIPMENT
FAIRBANKS-MORSE
DIESEL ENGINES

6058-OA31.14

3 FRANK QUESTIONS about WIRE ROPE SEIZING

1. WHY DO ARTISTS HATE TO PICTURE IT?

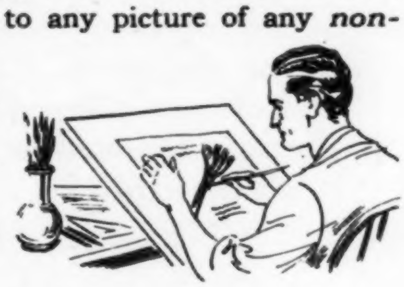
2. WHY DO SOME MANUFACTURERS HATE TO PICTURE IT?

3. WHY DOESN'T TRU-LAY REQUIRE IT?

Everyone who has ever handled *non*-preformed wire rope knows that, when cut, it requires seizing. Yet how many manufacturers of *non*-preformed wire rope show illustrations of seized ends in catalogs or other advertisements? For one thing, seizings are "eyesores" to artists who produce the illustrations.

1. WHY DO ARTISTS HATE TO PICTURE SEIZING?

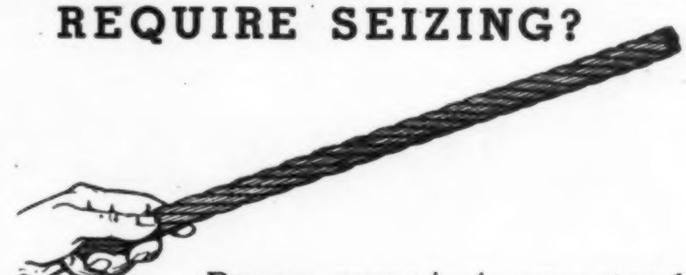
Well, artists are artists. They have a natural pride in good-looking pictures. No artist would draw a picture of a good-looking woman and then, as a finishing touch, put a bandage around her throat. Yet, to put the finishing touch to any picture of any *non*-preformed wire rope end, seizings *should be shown*. Otherwise it is an idealized picture, conveying the impression that the rope is preformed.



2. WHY DO SOME MANUFACTURERS HATE TO PICTURE SEIZING?

Because any wire rope which requires seizing has *internal tension*. It is never relaxed. Strands and wires have a constant tendency to straighten out—to "explode" as a watch spring does when released. Internal tension causes early fatigue. Naturally, no maker of *non*-preformed rope cares to call attention to these facts.

3. WHY DOESN'T TRU-LAY REQUIRE SEIZING?



Because every wire in every strand of TRU-LAY preformed wire rope is *relaxed*. The helical shape of wires and strands practically eliminates internal tension and friction. The tendency to straighten out—to unravel—to "explode"—is absent. When you cut TRU-LAY, wires and strands lie naturally in position—no seizing is required.

TRU-LAY preformed wire rope is made in all sizes, grades, constructions and lays. It costs a little more, of course, but *in the long run* it costs far less. May our engineers consult with you? Write for detailed information.

AMERICAN CABLE COMPANY, Inc.
WILKES-BARRE, PA.

District Offices:
Atlanta · Chicago · Denver · Detroit
New York · Philadelphia · Pittsburgh
Houston · San Francisco

FROM AN ACTUAL PHOTO

TRU·LAY *Preformed** Wire Rope

*PREFORMING IS A PATENTED MANUFACTURING PROCESS APPLICABLE TO ANY TYPE, GRADE, CONSTRUCTION AND LAY OF WIRE ROPE—WITH THE RESULT OF GREATLY INCREASING ITS SERVICE

Construction Methods

SERVICE SECTION

ALPHABETICAL INDEX TO ADVERTISERS

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Construction Methods* assumes no responsibility for errors or omissions.